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OF
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IN
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A Quarter Century of Technical Education in New South Wales.

*A MONOGRAPH PUBLISHED ON THE
OCCASION OF THE EXHIBITION OF
STUDENTS' WORK HELD AT THE
SYDNEY TECHNICAL COLLEGE, . .
EASTER WEEK, 1909.*



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Minister for Public Instruction:

THE HONORABLE J. A. HOGUE.

Permanent Under Secretary:

P. BOARD, M.A.

Technical Education Branch:

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PREFACE.

IN placing before the public this record of the first twenty-five years of organised Technical Education in this State, the Publication Committee desire to take the opportunity of thanking all concerned for their hearty and able assistance in its composition, compilation, and production.

The idea of marking the close of the first quarter-century of organised Technical training in New South Wales by the publication of this Monograph originated with the General Advisory Council, which Mr. Turner, the present Superintendent, called into existence immediately on his accession to his important office. Mr. Turner warmly approved of the idea, and a Publication Committee of six members of the General Council was appointed to draw up a scheme for the book. This scheme, when completed, was submitted to the Minister for Public Instruction, the Hon. J. A. Hogue, and he heartily fell in with the suggested plan, and kindly offered to write the Introduction, which appears under his name. It is to his action in arranging to place the resources of the Government Printing Office at the disposal of the Publication Committee that this Monograph has been rendered possible.

In this way the Committee have been enabled to submit to the public all over the world a record of solid progress in Technical Education, of which they venture to believe New South Wales will have no reason to be ashamed. No doubt much, very much, still remains to be accomplished ; but the progress of the past augurs well for a still more rapid growth in the future.

Australians are sometimes accused of an undue love for sport of all kinds, to the neglect, it is asserted, of a more intellectual training. The fallacy of those assertions is amply proved by the statistics contained in this Monograph. These show that, in proportion to the population served, the number of our Australian youths who, after a hard day's labour, eagerly devote their evenings to study and work in our Technical Colleges and Schools, bears favourable comparison to the record of any country throughout the civilised world.

While the chief credit for this publication is justly due to the Minister for Public Instruction for his action in the matter, the Publication Committee feel that they must not omit to acknowledge the great services rendered by others.

To Mr. Turner, the Superintendent of Technical Education, they are especially indebted, not only for his warm general support, but also for the able and comprehensive articles which he has contributed, and which form so important a section of this Monograph. They desire also specially to thank those officers who have supplied the various articles following their names, Mr. Parnell Johnson, the Lecturer in Industrial Art, for designing the cover, and the Government Printer, for their great assistance in forwarding the work.

What that assistance has been will be realised by all who are practically acquainted with press work, when it is understood that the whole of the Monograph has been designed, written, compiled, printed, and published within a period of about sixteen weeks from the date of the Minister's sanction.

The illustrations, which form so prominent a feature of the publication, have nearly all been prepared from special photographs by the College Operator, Mr. Tremain, the majority being taken at night by flashlight, and have been printed from photo-engraving blocks prepared in the Government Printing Office.

The thanks of the Committee are also due to the Proprietors of the *Sydney Mail* for the loan of seven of the blocks representing flashlight views of the Sydney College classes at work.

JOHN L. BRUCE,
Convener of the Publishing Committee,
and Editor of the Monograph.

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THE HON. J. A. HOGUE,

Minister of Public Instruction.

INTRODUCTION.

By THE HON. J. A. HOGUE (Minister of Public Instruction).

TECHNICAL EDUCATION is rightly regarded as indispensable to organized society. It is absolutely essential to human progress. Time was when a purely classic course at a University, crowning the elementary instruction imparted in the common schools, was considered an all-sufficient passport to success in life. There is no such thing as a finished education—no *Ultima Thule*, where one may say: Thus far have I come on the road of knowledge, and no further need I go. The field of knowledge is wide as the Universe. Knowledge is power, and the nation or the individual will succeed best whose acquired knowledge is widest, most suited to its circumstances, and best applied.

Under the light of Science, civilization is developing new activities. These bring with them the need of new methods in all avenues of industry—in Art, Commerce, Domestic Economy, in every department of human affairs. The nineteenth century saw vast and wonderful developments in Science, Art, Literature, Mechanical Engineering. It saw mechanical and industrial revolutions of greater import than were ever brought about by wars or changes of dynasties. It was an era of inventions, of breaking away from old-world traditions, of triumphs of mind over matter and the forces of nature. The progress made during that era continues. Different nations are keeping watchful eyes on each other's industrial methods, movements, and inventions. Statistics, the collection of which has risen to the dignity of a science, enable different communities to note exactly the progress made throughout the civilized world. The struggle for wealth and the race for national supremacy are fiercer than ever known before; and the convincing ground between rival countries has in late years been transferred, not entirely, but very largely, from the battle-field to the science classrooms, the Technical Colleges, and the Universities.

Education, which in former ages had a somewhat restricted meaning, and narrowed down to elementary subjects, *belles lettres*, and to arts, has in these later days broadened out so as to embrace every activity of life, contrasting as widely with what went before, as does the broad and majestic river with the creeks and tiny streams that feed it from their far-back sources.

The literature of Technical Education has reached such proportions that it is difficult for the ordinary student of human affairs to keep pace with its remarkable growth. It reaches proportions that compel specialization; and the industrial developments with which it deals are among the most striking characteristics of the age in which we live. New methods of extracting from Nature her secrets and adapting her mysterious forces to human requirements are constantly springing from the busy brain

of man and superseding old systems. That silent, intangible, imperceptible thing called Evolution is in no department of life more operative than in connection with the means which man adopts in exploiting the earth and in his methods of manufacture, production, and distribution. In primitive societies the tools employed to provide for human needs were simple and rude, but they served their purpose. Their use made small demands on the skill of those who handled them. As societies grew in complexity, the apprentice system came into existence, and the secrets of handicrafts were guarded with almost religious care. Just as it used to be thought that people existed for the benefit of kings, so was it supposed that the interests of the masses were subordinate to those of the instructed and expert few. These ideas have long since given way to more enlightened views, and it is now more than ever recognised that man does not live for himself alone. The training of the young in handicrafts, and for the various activities of life, which in former times was very much a family affair, is now seen to be a function that can, without any intrusion into the domain of domestic life or infringement of individual rights, be properly discharged by the State. Modern society is, indeed, a complex organism, and in civilized communities the family can no more live for itself alone, as in the tribal state, than can the individual man live for himself.

Also, it is becoming more clearly recognized that there is a close interdependence between the mental and industrial equipment of the child on the one part, and the requirements of the State on the other. The State requires, for its stability, its welfare, that the child shall be educated, that, as it passes out of the primary school with the foundation of knowledge laid, the superstructure shall be such as to ensure the reasonable development of such gifts and capacities as Nature has endowed it with.

Then, in the multitudinous forms which modern industrial life assumes, with its far-reaching changes in social conditions, comes the absolute necessity for higher and more scientific instruction. Machinery now plays so all-prevailing a part in the world's activities that the training given to our young men and young women differs radically from what was requisite in former years. The exigencies of a restless age demand that the artisan, the manufacturer, and the producer shall not merely be instructed how to handle and work a machine, but shall also be taught how to master its underlying principles. The training thus given tends to educate the mind as well as the hand, and thus develops the intellectual powers, and leads men to think problems out for themselves. To train our youths to think, and so to develop their faculties, is one of the purposes of technical instruction.

A country's best asset, as has often been said, is its people. A man's best asset does not consist of stores of wealth, but of the use to which he puts his natural gifts; and the country is the richer and happier, and safer, whose people make the best use of their mental and moral faculties.

Nothing is clearer than that the pressure of competition between nations (as between individuals) is compelling greater demands upon the mental and even the physical powers of mankind. Mechanical inventions may save much wearisome toil, and to a certain extent relieve man of the primal curse (if curse it be) of earning his

bread by the sweat of his brow ; but heavy demands upon his powers are yet made by the pressure of modern competition and the complex conditions under which he has to earn his living. Where before, he had to depend on his hands and his muscles, he now depends more upon his mind. The training of the mind, then, becomes a problem of the very first importance, if civilization is to go forward.

Here it may be well to remember that industry—using the term in its broadest sense—is the foundation of all human society, the spring of all progress ; it is the supreme differentiation between man and beast. To our industries we must look for all that makes for our happiness, welfare, and security. That being so, it becomes of paramount importance that our young men shall be so trained as to enable our country to keep pace in its industrial activities with other countries. The necessary equipment to this end, a course of instruction scientific in character alone can supply. The teaching of science, and scientific methods of imparting instruction, are to-day recognized as essential in our Schools, Colleges, and Universities. The fact that it has obtained this recognition, a recognition deeply rooted in our education system, is one of the most hopeful signs of the age. We live in an age essentially speculative and utilitarian. In the training of the young the great aim is, as it should be, utility. A nation's utilities and speculations play an important part in the education of its people. In the industrial life of a nation that looks to hold its ground, there can be no standing still. If we search for the secret of the marvellous progress made throughout the civilized world in modern times, we shall find it in its industrial life, and in that desire to excel which gives the spur to inventive genius and encouragement to talent.

It has been said that great men of action, apostles of great thoughts, and “lords of the great heart,” have sprung from no exclusive class or rank in life. On the contrary, the vast majority have been of humble origin. Most instructive it is, and quite germane to the subject before us, to trace the lives of great men of all ages. A few may be here enumerated. William Shakespeare was the son of a butcher and woolcomber. James Cook, discoverer of our continent, was the son of a labourer. Robert Burns, the son of a poor farmer, and himself a farm hand and gauger. From the masons and bricklayers came Hugh Miller, the geologist ; Ben Jonson, the dramatist ; Allan Cunningham, the sculptor. Dr. Livingstone, the great missionary, and Robert Tannahill, the Scottish poet, were weavers. Abraham Lincoln, greatest of United States Presidents, was a backwoodsman and railsplitter ; Andrew Johnson, another great President, a tailor ; John Bunyan, a tinker ; Faraday was the son of a blacksmith. But the list might be indefinitely extended, and in this respect no nation differs from another. It is interesting to study the lives of those who have left their footprints on the sands of time, for it will invariably be found that these teach those grand lessons of self-reliance and self-denial which enable men, while carving out their own fortunes, to add to the general stock of knowledge, and to the sum of human happiness. They were, most of them, largely their own educators. Necessity, the mother of invention, is also the parent of progress, and the great need of the age is the will to strive for higher ideals, and as each individual in the State works out his own destiny, he contributes to the sum-total of that which shapes the destiny of his country.

Technical Education, with which we have now to do, is of comparatively recent origin. It cannot be claimed for our own motherland that she at present leads the world in this field of action. A century ago she was foremost in mechanical callings and in the effective use of tools of trade. In some directions she has held her own ; in others she has been surpassed, notably in the organized and scientific methods of training the inventive faculties and developing the industrial capabilities and the self-reliance of her people which the German nation has adopted. Something too much, it may be thought, is heard of Germany and German methods of late years. But her education system, at any rate, compels admiration. In fields of original research, in almost every branch of science, and especially in educational methods, Germany and the United States of America are great exemplars. We would be unwise, foolishly self-contained, did we not drink from founts of knowledge wherever we may find them.

If in the Monograph here produced we are told much of what is being done elsewhere, it is well to see how we ourselves compare with other parts of the world, and in what way we may profit by what is being there achieved.

However, the time is thought to be opportune to look around and put on record some of the features of the movement that has given birth to the splendid systems of technical education which are doing so much to move the world along and add to the happiness of mankind. Also it is seasonable to take a review of our own efforts during the quarter of a century that has passed since our pioneers set their hands to the work. The field was not large when they began their self-imposed task. It was practically virgin soil they had to work in. They laid the foundations well. They had their hearts in the work. They foresaw the great need of it in the time ahead of them ; and they should for ever be held in honor for the noble service they rendered their country.

Technical Education.

By J. W. TURNER,
Superintendent of Technical Education in New South Wales.

- I.—GENERAL VIEW OF THE SUBJECT:
- II.—TWENTY-FIVE YEARS OF TECHNICAL EDUCATION IN NEW SOUTH WALES.
- III.—THE PRESENT CONDITION OF TECHNICAL EDUCATION IN NEW SOUTH WALES.
- IV.—THE FUTURE OF TECHNICAL EDUCATION IN NEW SOUTH WALES.

1.--A General View of the Subject.

TECHNICAL EDUCATION embraces such branches of instruction as have a direct relation to the various arts and manufactures. The subject thus covers a very wide area, and includes many different methods and processes of imparting practical knowledge, such as school-training in the theoretical basis of various arts, and an apprenticeship system in which manipulation reinforces theoretical definitions, postulates, and axioms. Technical Education, however, as understood since the agitation for its extension which arose in Great Britain chiefly after the Paris Exhibition of 1867, applies, principally, to instruction in those sciences which have a direct bearing on manufacturing industries, and in the principles which underlie mechanical and manipulative trades. The demand for increased attention to such subjects as come under the head of "Technical Education" arises partly out of the fact that various Continental nations had instituted special "Schools of Technical Education," on the fostering of which they expend large sums of money to the manifest advantage of their industries, and also from the fact that the modern system of manufactures at once demands greatly increased technical knowledge, while it has rendered the acquisition of such knowledge in the workshop increasingly difficult. Thus the minute subdivision of labour greatly circumscribes the area of the artisan's practical knowledge, and the extensive application of machinery in many instances makes him, so far as his work is concerned, little more intelligent than the machinery itself. Technical Education is now a world-wide movement, and Technical Schools are to be found in every important city, and even in many minor towns, in all countries boasting the advantages of modern civilisation, and large funds are annually devoted (by the State, by the Municipal Government, by Trade Guilds and Corporate Associations, and by private endowment) to the purpose of making

Technical Education easily accessible to all classes, irrespective of age, sex, and social position; for only in Technical Education does a nation secure industrial supremacy.

Technical Education had its beginnings in England with Richard Foley and Swedish steel; James Brindley and water-engines; James Watt and Matthew Boulton and steam machinery; Sir Richard Arkwright and the spinning-jenny; Edmund Cartwright and the power-loom; Robert Fulton (the American) and the steamship; George Stephenson and the "Rocket"; Thomas Telford and bridge-building; Henry Bessemer and the steel process; Robert Stephenson and railway construction; and many another pioneer in the realm of scientific industrialism, who founded, developed, or discovered new methods of applied induction and made new exploitations of the material universe. But though Technical Education had its beginnings in England, it has since had its greatest growth and development in Germany, in Switzerland, in the United States of America, and in the great Canadian Dominion.

GERMANY.

Technical Education.

Some thirty years ago, when the newly-born Empire had begun to recover somewhat from the tragedy of the conquest of France and the third Napoleon (1870-1871), a great political economist rose in Germany. His name was Friedrich List, and he was styled the "Father of Protection." It has also been claimed for him that, indirectly, he was the originator of Technical Education in Germany. This is, however, only partly true, because technical instruction has always formed part of the German Educational Curriculum. Nevertheless, the adoption of a new Industrial Policy as a weapon of international economic warfare made a new demand upon technical efficiency—a demand which was met with that genuine thoroughness which forms so characteristic a trait of the Teutonic temperament; and if technical and special instruction were before then advantageous to Germany's existence, it now became imperative to her progress; and since then the great Teutonic Confederation has never looked back.

It has often been said that the issue of the war of 1870-1 was largely owing to the fact that every German soldier was a mechanician. The cavalryman was a farrier who could shoe his horse, and a veterinary surgeon who could doctor it. The linesman knew the parts of his rifle, could take it apart, repair it if required, and put it together again. The artillerist was a practical engineer, to whom the mechanism of his cannon was an open book. Even the drivers of the baggage and ammunition waggon were blacksmiths and wheelwrights. The German army was a "Technical School," making a marching tour through France for educational purposes. An armed force of such perfectly human machines was invincible.

In the elementary schools of Prussia and Saxony free instruction combined with compulsory attendance had been in operation for the greater part of a century ; and in these countries at least there was an unlimited supply of highly intelligent workmen, who had received a liberal elementary education, and who (even as apprentices) brought to the exercise of their various crafts a useful grounding in technical knowledge, and (as W. H. Dawson points out in his excellent recent book, "The Evolution of Modern Germany") they possessed also, in many instances, a certain manual dexterity gained in the Continuation or the Professional School. Nevertheless, taking the Empire as a whole, Technical Education as an imperial and national German institution may be regarded as not older than the third of a century.

With the dawn of a new era, a determination to employ to the fullest extent the chemical discoveries of the world, and the illimitable possibilities of electricity in the arena of competitive international commerce, Germany prepared for the coming industrial struggle with a clear and perfect appreciation of all the advantages to be obtained from the completest technical training. To a certain extent, the nation was already equipped in this particular, for the best of the Empire's large Technical Schools (particularly those of Prussia and Saxony) are fifty and sixty, and some even a hundred years old. To-day these schools are legion, and are established in all the large towns, not infrequently in very small towns, and their administration embraces the entire realm of industry and of industrial art. It is noteworthy, moreover, that the Technical Schools are conducted on lines of absolutely economic efficiency. Expense is never allowed to triumph over utility, and costly ornamental figureheads are conspicuous by their absence. The Teachers are all severely practical ; yet the very best talent is secured. In Germany, it must be remembered, men of the highest competency in their distinctive departments can be obtained in any desired number for the best of the Technical Schools at moderate remuneration, simply because the standard of professional salaries is nowhere very high, and, because there is always a ready market for the services indicated, the supply is not only ample but constant. For instance, in the realm ruled by the Kaiser, the exclusive services of a University-trained architect can be had for a Technical College, conducted for the education of youths engaged in the building trades, at a salary of £210, rising to £310. This gentleman would have under his charge all the departments dealing with building construction, constructive materials, architecture, stone-cutting, draughtsmanship, and ornamental lettering. The services of an engineer with a University training for a cognate position can be obtained for a salary of £175, rising to £260, and he would have charge of the departments relating to building construction, constructive materials, mathematics, physics, geometry, statics, surveying, &c. Yet in Germany, Technical Education is so piously revered that no agency is neglected. It may be imparted by means of "the humble village

class, conducted in the winter evening hours by the light of the oil-lamp in the low-roofed school-room ; by the travelling exhibition of samples of skilled handicraft which sets provincial ambitions aglow ; by the itinerant teacher who carries a vitalising store of rudimentary technical knowledge from hamlet to hamlet, and from farm-house to farm-house in the sequestered mountain districts where home industry is the main support of the population during half the year " ; for the most impressive fact about Technical Education as developed in Germany is its comprehensiveness. It is applied to every occupation in which it is better for a workman to have than to be without. "Dresden China" is in itself a triumph of technical knowledge and technically acquired skill ; but Saxony, more than any other State in the Kaiser's dominions, fostered Technical Education until, as Dawson very accurately remarks, it "passed into the very life of the land and its people." In Saxony the oldest Technical School goes back to the middle of the Eighteenth Century. It dates from 1766, and bears the name of the Freiberg Academy of Mining. In 1769, the principle of obligatory education was introduced, and in 1805 (just after the awful tragedy of Austerlitz) it was systematically enforced. Chemnitz had a school of industrial design as early as 1796, and early in the Nineteenth Century the first three schools for lacemaking were established, while the town of Annaberg originated the system of Industrial Continuation Schools in 1823, being initiated by Zwickau in 1828 and by Chemnitz in 1829. Disregarding altogether the regular schools (Primary, Continuation, Middle, Higher), there are, upon a moderate computation, in this comparatively small country no fewer than 360 special schools which are exclusively engaged in imparting technical knowledge of some kind. Yet the population of Saxony is less than five millions ; hence the average of one systematic Technical School to every 13,000 adult and juvenile inhabitants is one extremely creditable. Moreover, there is nothing exoteric Governmentally imposed in this connection. As W. H. Dawson, in his book on Modern Germany, is careful to point out, the movement is emphatically the result of a spontaneous desire and enthusiasm for Technical Education. Hence, it owes its existence overwhelmingly to the initiative and independent action and sacrifice of the people themselves. Before the State ever troubled itself about Technical Schools these institutions existed in large numbers, and were doing a work of the greatest usefulness and value. Indeed, the Government is not obtrusive in its assistance, even to this day. As far as possible, the establishment of Technical Schools is allowed to proceed naturally from felt needs, and those who feel the need are allowed to supply it wherever it is practicable ; for it is held that these Schools, if they are to succeed, must be kept as closely as possible connected with practical life, and this means that practical men must, from first to last, have the handling of them. It is only in cases in which, from exceptional circumstances, the initiative and the requisite power thereof is lacking, or where universal and not merely local interests are at stake, that the State enters with its

authority. Even when the Saxon Government orders the provision of Technical Schools, it still relies to the utmost upon local interest and local effort. Local interest and local effort are, however, seldom lacking in practical Saxony, in which little Kingdom each place studies, not an impossible ideal, but an immediate necessity; and the industries mainly concerned in the matter are the parents and supporters, or the class they endow. Thus the Trade Schools (*Handelsschulen*) are very largely in the hands of merchants and the (differently named) manufacturers' associations. Of the sixty-one schools of this kind, fifty-five were established by such bodies; five are in private hands, and six are Municipal institutions. Of forty-six Industrial Continuation Schools (a technical differentiation of Continuation Schools proper), thirty owe their existence to Trade and Industrial Associations; one only is private, and fifteen are controlled municipally. But, on the other hand, most of the Higher Technical Schools, whether purely industrial or art industrial, are State institutions, for here larger outlays than private bodies could well be expected to incur are necessary, while many of the schools which encourage the rural-house industries could never have been called into existence, owing to the poverty of the population of the interested localities, had not the Government wisely taken the initiative. In parenthesis, and in this connection, one can hardly refrain from quoting the remark of Mr. Charles Moberly Bell, which fits Australia quite as appositely as it fits America—"Americans," said the Chairman of the Eighteenth Ordinary Meeting of the Royal Society of Arts, England (dealing with a paper by Sir William H. Preece, K.C.B., F.R.S., on "Technical Education in America"), "Americans (and, inferentially Australians) had to think of what they would do with their money; and, as they could not buy peerages in America, they endowed Schools with it." However, in Australia we have had generous benefactors, of whom Sir George Grey, Sir Samuel Wilson, John Henry Challis, Peter Nicol Russell, George Brookman, Sir J. Langdon Bonython, Hugh Dixon, and others stand prominently forth; but of these, more anon. The Government in Saxony, by the way, has a scrupulous eye on the tremendous responsibilities to the community of the wealthy, and has rigorously adopted the principle of requiring Trade Societies and private individuals to do all that they should, and all that they can, to promote the cause of Technical Education. The Trade Schools of Saxony are established, as a matter of easily understood necessity, in the towns, and the merchants and manufacturers support these schools with marked liberality, as they know by pleasant and profitable experience their immense value.

As Mr. W. H. Dawson is careful to point out, for easily understood reasons the Agricultural Schools in Saxony receive fairly liberal grants, while the Industrial Schools receive less, and the Trades Schools least of all. The last-mentioned are, of course, in the towns mainly, where also are the Industrial Technical Schools, which are generously aided by the Trade Guilds. In all cases the Government adopts a well-

nigh Spartan supervision, in every case throwing the burden of support upon the industrial and commercial classes which benefit most from the institution of these Technical Educational Academies.

The schools of Saxony may be divided, approximately, into five principal groups or classes, viz.—(1) the Higher Schools or Colleges ; (2) the Art and Art Industrial Schools ; (3) the Industrial Schools proper, with their adjuncts, the Industrial Continuation Schools ; (4) the Commercial or Trade Schools ; and (5) the Agricultural Schools.

It is the object of the Technical Colleges, in this advanced German kingdom, to afford the highest possible technical instruction (both theoretical and practical), and the State has, upon this account, undertaken the greater part of the cost of this branch of Saxony's educational system. At the head stands the Technical College of Dresden, founded as a Polytechnic School as long ago as 1828, and placed upon its present basis in 1871. It has five departments, devoted respectively to (*a*) Architecture, (*b*) Civil Engineering ; (*c*) Machine Construction and Electrical Engineering ; (*d*) Chemical Industries, with (*e*) a general department for Mathematics, Natural Science, Political and Social Sciences, Philosophy, Philology, &c., and for the training of teachers in Technical Science, Mathematics, and Physics. The great majority of students come from the Modern Higher Schools, few from the Classical High Schools, and nearly £1,700 a year is granted in exhibitions, gratuities to poor students, and in contributions towards the cost of scientific journeys and excursions, in order to encourage deserving talent in needy circumstances and to stimulate the spirit of scientific investigation.

The schools of the fourth group—the Commercial or Trade Schools—are sixty-one in number, and they owe their origin and wonderful success to the enterprise and commendable liberality of the Commercial Corporations and Associations, and also to the generosity of individual members of the merchant class, for communal action is very rare. Moreover, these schools are especially intended for apprentices—for the merchants of the future. The enthusiasm for Technical Education is so great, that not alone are there academies for the imparting of instruction in architecture and the mechanical, chemical, and electrical industries ; in the building trades ; in machine construction, including the training of overseers for the mechanical and electrical industries ; in industrial design, embroidery, weaving, dyeing, mining industries, &c., but there are actually seven State Schools of Navigation intended for the boatmen of the Elbe. Finally, there is an imposing array of ninety-eight Technical Schools (*Fachschulen*) distributed throughout Saxony, devoted to special local industries, handicrafts, and trades, and instructing in the year 1904 no fewer than 8,000 students.

At none of the schools to which reference has been made is attendance compulsory, although an indirect pressure is certainly exerted. This is accomplished in the following fashion. Since the year 1893, compulsory attendance in Saxony has

been legalised at a Continuation School. For three years after leaving the Primary School (that is, from the ages of 14 to 17 years) boys and girls must carry on their education in an advanced night school. Saxony was the second State in the German Empire to adopt this epoch-making method of coercion. However, with a view to economising time, they are given the option of passing these three compulsory years in a Technical School instead.

It is noteworthy that many of these young Saxons go at once to Industrial or Trade Schools, while others pass their compulsory years in what are known as Industrial Continuation Schools, a type of school which the Education Law of 1873 called into existence. These schools were forty-six in number in 1904, and were in that year attended by over 9,000 scholars.

The law relating to compulsory attendance is not regarded as a hardship, for the students who come under it not only attend school most willingly, but they often continue their attendance long after their legal duty has been fulfilled. Indeed, all the more intelligent and persevering students of the Continuation Schools pass on without any pressure into the Industrial Schools, which naturally increase from this reason both in number and popularity. Compulsion in Saxony has been such an emphatic success that it could with perfect safety be now dispensed with; in fact, the educational authorities place far less reliance on the rigour of the law than upon fostering the spontaneous desire to learn, to know, and to excel. In Prussia, however, what one might term "regimentation" is more vigorously enforced.

Every five years the Department of Education of Saxony publishes a complete register of the Schools throughout the country, recording what each has done or failed to do—awarding praise without stint to the praiseworthy, and turning the fierce searchlight of comparison upon the dilatory and backward. It is, by the way, instructive to note, in passing, that considerable laxity is purposely allowed in the requirement of formal certificates of efficiency of the usual examination type, on the ground that in the Lower Technical Schools the demand made is rather for practical ability than an encyclopædic knowledge of theory. One of the means adopted for the promotion of friendly rivalry is the holding of periodical exhibitions of students' work, these being intended, not so much for the general public as for the schools and the teachers themselves. All schools are thereby encouraged and even expected to take part, no matter what proficiency may be attained, whether it be great or small. "There are no parade horses at our exhibitions," remarked the Saxon Director of Education to a British visitor; "Our object is not to create a spectacle, but to produce solid results."

Germany as an Empire stands first among modern nations in her great love of the education of her people, and in her wise and comprehensive provision for the efficient attainment of her noble ideals. From the general view of the subject here given, it will be advantageous to descend to particular details.

The Realschulen of Germany.

The German Realschule, which compulsorily provides educational equipment up to 17 years of age, is the great national seminary for the majority of the Empire's younger students. They have a curriculum (*vide* that of the second State Realschule of Dresden, Vol. III, pages 59 to 63, N.S.W. Commissioners' Report) which embraces the following subjects, arranged for six classes, namely :—Religion, German, French, English, Geography, History, Nature-Description, Physics, Chemistry, Arithmetic, Algebra, Descriptive Geometry, Geometry, Drawing, Writing, Singing, Gymnastics, and Stenography (optional). It will be noted that the curriculum excludes Latin and Greek, and substitutes French and English in its language requirements. There are also Ober Realschulen, with a nine years' course, which also exclude the classical in favour of modern languages. The curriculum of the Commercial Section of one of these latter—namely, that conducted at Karlsruhe, in the Grand-Duchy of Baden—is as follows :—German (commercial correspondence and language), French (commercial correspondence and conversation), English (commercial correspondence and conversation), Book-keeping, Commercial Science, Commercial Arithmetic, Commercial Geography, History, Stenography, Gymnastics, and Italian.

The Realschulen have an extended course of a second three years, and leave the youth at 20; but up to 17 the course is compulsory, as a reference to the introduction to this monograph will readily show, such particularly being the case in Saxony and Prussia, the leading German countries in the important matter of Secondary Education. These Realschulen are attended very numerously by boys who purpose following a business career. The early years of the course are devoted to general instruction in Modern Languages, Mathematics, Natural Sciences, Geography, Drawing, Singing, and Gymnastics. The German, with his Teutonic thoroughness, and his firm belief of the necessity of the enforcement of the principle of "*mens sana in corpore sano*," is a vehement advocate of the virtue of gymnastics in a school or college curriculum. In the latter years of the course the instruction becomes more specialised. The great feature of these Realschulen is the splendid success they achieve in the teaching of Modern Languages. Mr. Consul Powell, in his most instructive report on Commercial Education in Germany, published at the end of 1898, says that his object in writing was "to make it apparent how widely and energetically the German nation was aroused to the necessity of Commercial Education as an important factor in their newly developed competition with other trading nations, and especially was it noteworthy to remark how the study of modern languages was being encouraged and fostered by the nation at large."

The Fortbildungsschulen of Germany.

In Europe the Technical Education provided for every class is proverbially thorough, and goes far beyond anything Australia has yet reached. The Continuation

and Trade Schools of Berlin (Fortbildungsschulen) constitute a noteworthy example in the educational realm of extensive and complete provision for well-nigh every conceivable energy and exercise of the human faculties in a civilised environment. The buildings and the equipment are in every case excellent, and the teachers stand foremost in the ranks of similar mental directors in any part of the known world.

The Continuation Schools of Berlin comprise: (1) Municipal Continuation Establishments; (2) (*a*) Municipal Continuation Schools for Youths, (*b*) The Trades Union Continuation School, (*c*) Commercial Continuation Schools of the Berlin Corporation of Commerce, and (*d*) Trade and Continuation Schools; (3) Continuation Schools for Girls; and (4) The Municipal Continuation School for the Deaf and Dumb.

The courses comprised in the curriculum of these Continuation and Trade Schools include such diverse subjects as German (of course) and Millinery, Arithmetic and Gymnastics, Drawing and Ironing, Book-keeping and Singing, Technical Drawing and English, Geometry and Tailoring, Physics and Chemistry and Machine Sewing, French and Manual Training, Technical Instruction, Modelling, and a number of trade courses. In Germany youths are taught the scientific principles of shaving and hair-cutting, and there is even such an Australianly out-of-the-way thing as a class for scientific instruction in the theory and practice of chimney-sweeping.

The teaching of the French and English languages is of that thorough nature which enables pupils to *speak*, and not merely to *read*, understandingly. The Municipal Continuation Establishments, for instance, provide a specially graduated course in French and English, and particular attention is paid to fluent oral and written expression. Commercial Arithmetic, Book-keeping, Stenography, and Typewriting receive corresponding attention, for the aim of these institutions is to enable persons engaged in practical callings to receive, to strengthen, or to supplement an education corresponding to that provided in a "Middle" School. There are four Continuation Schools of this higher type in Berlin, and a feature worthy of notice is the utilising of school buildings for more than one course of instruction.

These four particular schools have, by the way, their specialities in the matter of instruction, although in all of them prominence is given to the teaching of the leading modern languages, namely, German, French, and English. Commercial Arithmetic, Book-keeping, Stenography, and Typewriting are also common to the whole four schools. But Mathematics is taught in the Freidrichs Gymnasium only, Drawing in the Freidrichs Gymnasium and the second Realschule (Höhere Bürgerschule) and Physics only in the latter, while Writing is made a special subject in the Dorotheenstädtischen Real Gymnasium, which particularises with similar prominence Correspondence and Commercial Science. The instruction is imparted in the evenings between a quarter past 7 and 10 o'clock (inclusive of Saturday), and on Sunday mornings from 8 o'clock to a quarter past 9. Educational work is throughout the Empire a distinguishing feature of the morning of the Seventh Day.

The objects for which the Municipal Continuation Schools for Youths exist are the consolidation and supplementation of the education obtained merely at a Primary or Folk School, and this training is particularly provided for those youths who have entered upon a practical calling, and is imparted both through instruction of the theoretical description and practice. The stimulation of the intellectual and moral stamina, as well as the professional ability of the student, is also made a subject of careful and continuous attention. But these Municipal Continuation Schools for Youths have yet a further *raison d'être*, namely, the instruction of young men (even in knowledge the most elementary) as a supplementation to the deficiencies of their earlier education, or even a reparation of its absolute neglect.

Of these schools there are in Berlin thirteen, and the courses provide for instruction in French, English, Physics, Chemistry, Algebra, Geometry, Book-keeping, Stenography, and Typewriting, and in a few of them are taught such subjects as Commercial Correspondence, the Theory of Exchange, Commercial Science, and the knowledge of Merchandise, together with History and Geography, Knowledge of the Law, Professional Drawing, Modelling, Trigonometry, and Caligraphy. Moreover, in the ninth Fortbildungsschule, instruction is given in such a recondite subject as the Russian language. In the majority of Schools much of the instruction is gratuitous, though a half-yearly charge is made, amounting only to a few shillings, for courses in Foreign Languages, Drawing, Modelling, and Book-keeping. Pupils taking the Figure Drawing course are charged 4s. for the half-year; those taking Stenography, Typewriting, and the Commercial courses are charged a fee of 1s. for the half-year.

Instruction in these schools is given on every evening of the week (Saturday inclusive), between the hours of 7 and 10, and on Sunday mornings between 8 and 12. The time on Sunday is devoted principally to Modelling and to Drawing in all its branches (figure, ornamental, from casts, the living figure, compass, technical, water-colour, freehand, &c.), although in certain schools some time is given to Caligraphy, Arithmetic, Stenography, Typewriting, Book-keeping, and the Theory of Exchange.

With the Germans, Drawing is a predominant subject in all Continuation Schools.

The evenings are occupied chiefly with the teaching of Modern Languages (French and English, besides the Mother Tongue), four hours a week being devoted to each. Science, Mathematics, and Commercial Arithmetic come next in order of importance; while Typewriting, Stenography, and Book-keeping are by no means neglected. A course in Law is given to students in two Continuation Schools, while in another the Theory of Exchange is taught. History and Geography are subjects of instruction in only one of the Municipal Continuation Schools for Youths.

The Trades Union Continuation Schools in Germany.

The German Trades Union Continuation Schools are conducted by an officer appointed by the Committee of Instruction. The curriculum adopted by this type of school is divided under three heads, namely, (a) Elementary, (b) Commercial-Industrial, and (c) Technical Instruction.

Under Elementary Instruction are arranged the three subdivisions of Lower, Middle, and Upper Courses, which comprise respectively :—(1) Arithmetic, Calligraphy, Orthography, a knowledge of German (the Mother Tongue), and Reading ; (2) Advanced lessons in the foregoing subjects with the addition of instruction in Roundhand Writing, Business Exercises, and Commercial Correspondence ; (3) Simple and Commercial Arithmetic, Computation of Areas and Volumes, Essay and Letter Writing, German and German Literature and Local Geography (Vaterlandskunde). The half-yearly fees charged for each of the three courses is two marks—about 1s. 10½d. in British coinage.

Under Commercial Industrial Instruction are grouped the following subjects, namely, American Book-keeping, Book-keeping (double entry), Book-keeping (single entry) with the Theory of Exchange, Commercial Arithmetic, Elementary French, Advanced French, Elementary English, Advanced English, and Stenography. The fees charged for half-yearly courses in the foregoing subjects range from one to four marks. In this type of School, Drawing is also taught on Sunday mornings from 9 o'clock to 1. The Commercial Industrial Schools are not restricted to the exclusive instruction of boys and young men ; ladies may also avail themselves of these educational advantages.

The Technical Division of the German Trades Union Continuation Schools provides for instruction under the following heads, namely, Professional Drawing for Upholsterers and Decorators ; Freehand, Perspective, Compass and Ornamental Drawing ; Professional Drawing for Joiners, Turners, &c. ; Professional Drawing for Engineers, Locksmiths, &c. ; Singing—(1) Choir-singing (male voices), (2) Choir-singing (female voices), and (3) Preparatory Class ; Gymnastics (three divisions), Men, Apprentices, Women. The fees for the half-yearly course range from about 3d. to 3s. Drawing, it will be noted, is the almost exclusive medium employed in the German Continuation Schools for imparting technical knowledge.

Commercial Continuation Schools of the Corporation of Commerce, Berlin.

The Commercial Continuation Schools of the Corporation of Commerce in Berlin are under the management of a "Curatorium" comprising four representatives of the Corporation of Commerce, three representatives of the Mercantile and Industrial Association, three nominees of the Minister for Commerce and Industry, one

representative of the Junior Merchants' Association, one representative of the Minister for Commerce and Industry, one representative of the City, and the Director of the Commercial Continuation Schools—fourteen members in all. The fees are higher in this type of school, and range from 9 marks to 13 marks 50 pfennings half-yearly for weekly lessons of two hours and of four and more hours respectively.

Of these admirable schools there are six in Berlin, and the course of instruction is divided into Summer and Winter Terms or Semesters. In one of these institutions (the Friedrich Werdersches Gymnasium) eight hours a week during the first semester are devoted to the study of the modern languages (French, Russian, and English), both in their elementary and higher stages; ten hours a week to Typewriting, Stenography, Book-keeping (single and double entry), Commercial Arithmetic in its elementary and advanced stages, Writing, Theory of Commerce and Exchange, Commercial Methods and Counting House Practice; and two hours a week to German and Commercial Economy; while there is also a course in Political Economy. During the second semester, a course in Knowledge of Merchandise is given, in addition to the subjects enumerated above. The hours of teaching are the same, but the instruction in languages is more advanced, and more time is devoted to Book-keeping by double entry.

In the Luisenstädtisches Realgymnasium, Typewriting and Political Economy are omitted, but Spanish is added to the languages to be studied, while the other subjects and hours are similar. During the second semester the language course is harder than in the precedingly-mentioned Gymnasium, conversation being made a special feature. Moreover, there is a larger amount of instruction given in Book-keeping by double entry and in Stenography.

In the Köllnisches Gymnasium, Russian is dropped out, though Spanish and Italian are included; while in the Königstädtisches Gymnasium the only Modern Languages taught are English and French. This statement applies also in a general sense to the two remaining institutions, the tenth and the third Realschulen. These six Continuation Schools are models of what seminaries for Commercial Instruction should be under modern conditions.

Trade and Continuation Schools in Germany.

The German and Trade Continuation Schools, specifically so-called, are maintained by the State, the City, the Sunday Free School Union, and by the various Guilds. Of these institutions there are seven, one belonging to each of the following trades, namely:—(1) The Shoemakers; (2) the Saddlers; (3) the Smiths; (4) the Chimney-sweeps; (5) the Bakers; (6) the Tailors; and (7) the Potters.

The subjects include Drawing, Book-keeping, German, and Arithmetic. It is worthy of note that instruction is free for apprentices, but journeymen or masters

pay a fee of one mark a quarter. This, however, does not apply to each of the seven Schools, some making charges as high as four marks a quarter for journeymen, while others make a charge of two marks for apprentices. The subjects also vary slightly; but Drawing almost invariably holds its pride of place. In the School maintained by the Bakers' Guild, "Germania," instruction is given in Chemistry and Book-keeping, and in the School maintained by the City and the Potters' Guild the time is devoted chiefly to theoretical professional instruction, Professional Drawing and Drawing from Plaster and Wood Models.

The German Continuation School for Girls.

In Germany the Continuation School for Girls may be divided into two classes, namely, those under Municipal control, and those established by Unions or "Curatoriums." Of the former type there are in Berlin nine, and of the latter four. The object of these Schools is the consolidation of the education usually received by every girl engaged in practical employment of all kinds, in order to impart a mental stimulus, to confirm an earnest view of life, and to foster inclination and to improve the skill in those branches of human effort and energy suited to the sex of the students. Where education has been deficient, the Schools, moreover, supplement and increase it. This applies particularly to women who have passed their girlhood, and who desire to make good the loss or absence of opportunity in past years. Besides the usual subjects, which, of course, include Drawing, these "Fortbildungsschulen" provide courses in Needlework, Cutting-out, Sewing-machining, Dressmaking, Millinery, Singing, Gymnastics, Caligraphy, &c., although the expressed official view does not encourage the *idea that these schools exist exclusively to serve for technical instruction*. The programme of one school is substantially typical of all the others. If variations in the number of subjects taught and the arrangement of the time-table occur, they are but slight, and the general character of the whole remains unchanged. Machine-stitching and Cooking are features of two of the schools, while Repairing is confined to one school only out of the nine under Municipal control. Throughout, prominence is given to instruction in useful work suitable for women, while cultural branches of knowledge are not neglected, the dominant idea, of course, being that the instruction should be, first of all, practical.

In the four schools controlled by Unions or "Curatoriums" the instruction in German is obligatory; the other subjects differ little, however, from those taught by the Girls' Continuation Schools under Municipal control, although, perhaps, more attention is given to Technical Education pure and simple. The Commercial and Industrial Continuation Institution for Young Women, and the Commercial School and Commercial Institution for Girls in the Dorotheen Municipal Realgymnasium, while imparting technical knowledge applicable to trades and industries in practical

wage-earning, make a feature also of fitting students for the office and the desk, the pursuits of merchandise, &c. They practically parallel in their curricula the Commercial Industrial Trades Union Continuation Schools for Youths and Young Men.

The "Times" Review of Industrial Education in Germany.

The London *Times* of 4th December, 1903, in its fifteenth article on "Industrial Conditions in Germany," speaks eloquently of the Continuation Schools which form such a feature of the scheme of Teutonic Education. After making a detailed survey of the general scheme as given in the preceding pages of this monograph, the authoritative English journal applauds the type of trade-teaching schools which bear the general designation "Continuation," particularly as they are conducted in Saxony and in parts of Prussia—Nassau, for instance. The *Times* continues:—"As Düsseldorf is one of the latest towns to adopt these Schools, it may be taken to illustrate their aims and character according to the most recent ideas. The by-law establishing the Schools, and authorised on 10th December, 1901, provides that all apprentices and youthful workers engaged in every sort of trade, including commercial business, in the town, are bound to attend the Continuation Classes on the days and hours appointed until the end of the school half-year in which they complete their 16th year. If they fail to reach the standard required, the liability may be prolonged for another half or full year. Only those are exempted who can produce evidence to the satisfaction of the School Committee that they possess the knowledge and acquirements which it is the aim of the school to impart. Youthful workers, apprentices, &c., who have passed the school age may be admitted as voluntary pupils on payment of the school fee, with the consent of the Committee. Employers are bound to contribute 1s. 6d. quarterly for each scholar employed by them of school age; voluntary scholars pay the same. Scholars are bound to attend regularly and keep the rules, under a penalty of 20s. or three days' imprisonment. The latter has been applied in two or three cases. Parents and guardians are bound not to keep boys from coming and employers are bound to let them leave off work in good time to attend school, both under the same penalty as above. . . . The principle is, while training the hand and eye, to make the exercise bear specifically on the trade in which the pupil is engaged, and great ingenuity is expended in adapting the lessons accordingly."

The excellent effectiveness of the system is due, as the *Times* is careful to point out, to the public spirit and the individual effort which stand behind Government initiative:—"The German Continuation Schools are for the most part administered and maintained by the Municipality, under Government supervision, and with the aid of a grant. They also receive, in many cases, substantial support from employers, who have also founded and maintained such schools, where they did not otherwise

exist, on their own initiative. Other employers again, where there are none, insist that their apprentices shall attend neighbouring schools. A special class of Continuation Schools, called 'Work Schools,' is maintained in the State Mining District of the Saar, and the miners of the Ruhr coalfields have a number of their own."

Industrial Craft Schools.

Besides the numerous schools and gymnasia which deal mainly with purely cultural subjects, there are in nearly all the great towns throughout the German Empire numerous Industrial Craft Schools devoted to the imparting of the theoretical principles and the manual practice of the various trades necessary to modern civilised existence in all its reticulations. The instruction given in these invaluable institutions is not only general, but theoretical; it is also technical and practical. The Industrial Schools of Hamburg undertake courses in Building, Higher Engineering Construction, Shipbuilding, Electrotechnics, Carriage Building, the Artistic Industries, Chemistry, Theory of Building Material, Constructional Mechanics, or Statics, the Theory of Elasticity, Graphical Statics, Statistical Calculations in connection with Building Construction, Stone-cutting, the Theory of Building Construction, Architectural Drawing, Design of Details in Building Construction, Building Estimates, the Theory of the Form of Buildings, Architectural Form, Architecture, Architectural Drawing, Designs for Buildings, Building Design under Examination and Surveying.

The heading "Artistic Industries" embraces such arts and crafts as Decorative Painting, Cabinet-making, Sculpture, Wood Carving, Modelling, Metal Working, &c.

Other schools take up instructional courses in Optics, the Theory of Heat, Electricity and Magnetism, Mechanics, the Elements of Machinery, Mechanical Technology, Laboratory Practice in Chemistry, Methodology and Technical Material for Drawing, Descriptive Geometry, &c.

Besides the foregoing, the State Evening and Sunday Industrial Schools of Hamburg impart technical instruction in Carpentry and Joinery, Turning, Glazing, Upholstering and Upholstering Decoration, Coachsmithing, Engineering, Blacksmithing, Locksmithing, Tinsmithing, Working in Electrotechnics, fine Mechanical Construction, Watchmaking, Gardening, Tailoring, Conventionalising Plant Forms, Decorative Painting, Costume Drawing, Pose Drawing, Letter Drawing on Sign Painting, Heraldic Drawing, Lithographing, Photo-Lithographing, Modelling in Clay, Wax, and Lead, Technical Information for Glaziers, Technical Information for Gold and Silver Smiths, Professional Drawing and Modelling for Gold and Silver Smiths, Physics for Gold and Silver Smiths. In short, there is no industry and no branch of commerce outside the scope of these wonderful Continuation, Trade, and Technical Schools, and what is true of Hamburg applies also to hundreds of other German cities and towns. The Science and Art of the Baker's craft, by the way, receives the minutest attention.

The Technical High School of Charlottenburg, Berlin.

The Technical High School of Charlottenburg, Berlin, is the crown and apex of the German industrial-instructional system. The "Königliche Technische Hochschule zu Berlin," situated at Berlinerstrasse, Charlottenburg, a suburb of the German Capital, is not only housed in one of the City's finest buildings, but it is also one of the best equipped and most renowned Technical Universities in the world. It was founded in 1879 by the amalgamation of two already existing schools, namely, the Bauakademie (dating from 1799) and the Gewerbeakademie (dating from 1821). Its present constitution was determined by the Statute of 28th July, 1822. This chief of all Technical Universities is governed by a Rector, a Pro-rector, and a Senate, and at the head of each Division, or School, or Department is a President. It has a very large number of ordinary and extraordinary Professors, Permanent Assistants, &c. The magnitude of this incomparable Institution is stupendous, and its creation marks an enormous advance in the history of Technical Education throughout the civilised world. The Institution is immediately under the control of the Minister for Ecclesiastical and Educational Affairs, and its expressed object is the furtherance of the education of those engaged in technical and industrial callings, either in the State service or in that of the general community, and it has the further object of promoting, by research and otherwise, those branches of scientific and artistic knowledge which have any relation to technical and industrial callings.

The Technical University of Charlottenburg is divided into various departments, which may be increased in number by the Minister for Education at any time the necessity arises. The existing departments are six in number, namely, Architecture, Civil Engineering, Mechanical Engineering, Naval Architecture and Marine Engineering, Chemistry and Metallurgy, and General Science—in particular the Mathematical and Natural Sciences. In connection with each of these Divisions there are workshops, laboratories, cabinets of apparatus, museums, and experimental stations for the furtherance of special Technical Scientific Knowledge appertaining thereunto.

In order to extend or to complete the instruction given by means of lectures, there are practical exercises set for the students in the class-rooms for instruction in Drawing, or in the laboratories, workshops, and experimental stations. Tuition is, moreover, imparted in the museums, through the media of cabinets of collections, and also by means of field excursions whenever the latter are either appropriate or necessary.

The collegiate course extends over four years, though in certain cases only a portion of each year is set aside for instruction. Vacational periods extend from the 1st of August to the 1st of October, with a festive recess of a fortnight at Christmastide and at Easter respectively. At least six weeks before the beginnings of the New Terms, programmes of study for each Division, with a list of exercises and lectures,

are published for the information of the students, who have, however, the choice of such of the latter as they decide to attend.

The Departments are not regarded as self-contained and complete schools of training, and the students are, consequently, permitted to attend lectures in other courses of a related nature, and even in the branches of study recommended a certain number of extra departmental classes are always included. The Department of General Science, for instance, is in reality common to the whole course of study, since it deals with the more general and less technical subjects.

All ordinary regular, that is, matriculated students must possess the Maturity Certificate of a Gymnasium, or of a Prussian Realgymnasium, or of a Realschule of the first rank, or of a Prussian Oberrealschule, or of a Gewerbeschule with a nine years' course and two foreign languages, in order to be admitted; otherwise they must present alternate satisfactory evidence of sufficient previous training, and such exceptional cases are subject to the Minister's approval. This rigorous condition is to ensure a thorough primary education. It is worthy of note that, as far back as 1898, of 2,000 matriculated students, 54 per cent. were from Gymnasias, 39 per cent. from Realgymnasias, while 7 per cent. were from the lower schools.

In connection with the admission of matriculated students, educational institutions in other parts of Germany assessed as being of a grade corresponding to that of the Technical University of Charlottenburg are officially registered. There are, by the way, in addition to the matriculated students, what are known as "Hospitanten," who do not possess the necessary qualifications to enter as regular students, and whose admission is restricted to special courses of lectures and laboratory work; and "Freihörer," who are admitted under special conditions. Foreigners are also accepted as matriculated students, on satisfactory evidence of possessing sufficient previous training. In this connection, if the President of a Department be in doubt, the question is remitted to the Senate. Students are, as a rule, admitted only at the beginning of the academic year; but, if the courses allow of it, also at the beginning of a term, and, although a definite selection of a course of study must be made, a later change of subjects is debarred in no way. The course, as previously pointed out, extends over four years only, nevertheless some 12 or 13 per cent. of the students continue their studies beyond this period.

This great Technical University confers the degree of "Diplomaed Engineer," and also that of "Doctor of Engineering"—a right conferred by the law of the 11th of October, 1899, after a lengthy consideration of the academic dignity and the educational value from a liberal and general point of view of thorough training in any of the branches of higher technology.

From all students is required an entrance fee of thirty marks—the mark being equivalent to a sum less than an English shilling by the minutest fraction—and the fee for ordinary courses is determined for each half-year by the number of hours per week

occupied by the instruction. For regular students the lectures are assessed at four marks and practical work at three, while for "Hospitanten" or irregular students the fees are, respectively, lectures five marks, and practical work four. If the lectures be repeated, a reduction of 40 per cent. is made in the case of students belonging to the German Empire.

For participation in practical work in the Inorganic, Organic, Technical Chemistry, Metallurgical, Electro-chemistry, and Photochemical Laboratories the charge is 85 marks per half year; for practice in Physical Chemistry, 15 marks; for practice in the Laboratory for Heat Technique, 20 marks; in the Mechanical Laboratory, 20, 30, or 50 marks; for practice in Photography, 60 marks; the fee for practical work in the Electro-technical Laboratory is 50 marks for regular students and 60 marks for "Hospitanten." The fee for the Geodetic Praktikum is 12 marks. For the course in Helioprinting, &c., from three to six marks are charged according to whether it is for a period of two weeks' duration or of four. Those who undertake practical work in the Chemical Laboratories are charged a fee of fifteen marks for the half-year as a security against damage. The total fees per annum would therefore average a sum of three hundred or three hundred and fifty marks (roughly, about £14 15s. to £17 15s.). However, scholarships ranging from four to six hundred marks, and derived partly from State funds and partly from the towns are annually awarded.

In connection with this Technical University are allied institutes and collections of various kinds. In the Department of Mechanical Engineering, for instance, there are an Electro-technical Laboratory and a Chemical Laboratory; in the Department of Chemistry and Metallurgy there are the Organic, the Inorganic, and the Metallurgical Laboratories, the Mineralogical and Geological Institute, and the Organic, Photochemical, and Technical Chemistry Laboratories. The Department of General Science has associated with it the Physical Institute. Intimately connected with the Technical High School, also, is the magnificent establishment for Experimental Research in the provinces of Mechanics and Technology, situate at Gross Lichterfelde, about $5\frac{1}{2}$ miles from Berlin. This is conducted by a staff of about sixty persons and has four Departments, namely, for the Testing of Metals, for the Testing of Building Materials, for the Testing of Paper, and for the Testing of Oils. At Charlottenburg itself there is a finely fitted and arranged Mechanical Workshop in connection with the University, which, besides a very complete and noble library, possesses the following twenty valuable collections of materials, forming also an important part of the splendid equipment of this renowned institution, namely:—(1) The Beuth-Schinkel Museum; (2) a Collection of Plaster Casts; (3) the Callenbach Collection; (4) the Architectural Museum; (5) a Collection of Building Materials; (6) a Collection of Building Models; (7) a Collection of Geodetical Instruments; (8) a Collection for Illustrating Road Engineering, Railroads, &c.; (9) a Collection for Waterworks; (10) a Collection for

Iron Structures in Connection with Civil Engineering ; (11) a Collection Illustrating Railway Construction ; (12) a Collection Illustrating Bridge Structures ; (13) the Reuleaux Kinematic Collection ; (14) a Collection for Illustrating Mechanical Engineering in connection with Railways, Rolling-stock, &c. ; (15) a Collection for Illustrating Mechanical Technology ; (16) an Engineering and Mechanical Collection ; (17) Naval Architectural Collection ; (18) a Photo-chemical Collection ; (19) a Mineralogical Museum ; and (20) a Physical Collection. These are all very complete, recent in type, and admirable in every necessary respect.

A conception of the magnitude of this great Technical University may be formed from the fact that it had in the Winter Term of 1901-2 no fewer than 3,493 regular students and 1,318 Hospitanten, &c., making altogether a total of 4,811. There were 6 Principals, one at the head of each Department ; 47 Ordinary Professors, namely, 8 supervising the courses in the Department of Architecture, 9 that of Civil Engineering, 11 that of Mechanical Engineering, 4 that of Naval Architecture and Marine Engineering, 7 that of Chemistry and Metallurgy, and 8 that of General Science ; 41 Extraordinary Professors, thus allotted : Architecture, 10, Civil Engineering, 5, Mechanical Engineering, 8, Naval Architecture and Marine Engineering, 1, Chemistry and Metallurgy, 7, and General Science, 10 ; 65 Private Teachers ; 42 Permanent Assistants ; 8 Consulting Engineers ; and 3 Lecturers in Foreign Languages—in all, a Teaching Staff of 212.

Of the 3,493 regular students, about one-half were devoted to the study of Mechanical Engineering ; 624 to Civil Engineering ; 493 to Architecture ; 360 to Chemistry and Metallurgy ; and 327 to Naval Architecture and Marine Engineering ; while one student only was registered exclusively in the Department of General Science ; but it must be remembered that this embraces a number of composite courses supplementary to those affecting special professions and lines of special study.

It is impossible to attempt within the limits of this monograph a detailed examination of the programme of study for any one of the six Departments throughout the four years of the set course. Suffice it that they are all most thorough, most definite, most exhaustive, most analytically theoretical, and most absolutely practical. In this, as in all else, the Teuton has a reason for doing everything, and does nothing without a reason.

Germanic Technical Education and the Modern Spirit.

The Charlottenburg Institution is the largest and most eminent Technical High School in Germany ; but all the Technical High Schools throughout the Empire are magnificent seminaries of corresponding instructional value, and are in similar fashion splendidly staffed and adequately equipped. Among them the most prominent and praiseworthy are the Technical High Schools of Karlsruhe, Darmstadt, Aachen, Hanover, Hamburg, and Munich. Indeed, taking the High Schools of Germany as a

whole, one can describe their perfect equipment in words only of hyperbole—they are absolutely lavish in their *materia experimenti*. The teaching staffs are very large, very highly trained, and thoroughly expert and scientifically accomplished. As a natural consequence, the teaching imparted is of the highest order and of the most searching thoroughness. The leaders in these Schools are men of great intellect, large and invaluable contributors to the advancement of Science and Learning, and the amount of original research and scientific investigation carried on in the Technical High Schools under their supervision is too great to be designated as merely important. On this account alone specialism in teaching has reached its highest watermark. It is, by the way, worthy of note that although the German Technical High Schools are not absolutely identical, they are very similarly organised, and a comparative study of all would result in the selection of an individual one as a type of the remainder.

And what, it may be asked, is this intensity of national application to the growing demands of civilised existence due? We find the answer in one of Goethe's letters to Eckermann. Therein the mighty German wrote: "I will tell you something, and you will often find it confirmed in your later life. All epochs of retrogression and dissolution are subjective; on the contrary, all progressive epochs have an objective direction. Every resolute endeavour turns from within to the world without." No words, says a modern critic, could better characterise the change which has come over the land of Goethe in modern times, or better describe the significance of that change. The last fifty years have witnessed the decay and end of the old "subjective" epoch of self-absorption, of concentrated self-centred national life, and the opening and the triumph of a new "objective" era of external effort, beginning with foreign trade ambitions, and culminating in ambitious foreign politics. This, more than anything else, is the distinguishing mark of the Germany with which the world to-day has to do—the abandonment of the old national forms of life and the resolute pursuit of world aims and a world career, with the determination if not to win absolute primacy amongst the nations and empires of modern civilisation, at least to dispute such primacy with any existing or potential claimant.

All progress, in the dictum of Herbert Spencer, means change, though it does not necessarily follow that all change means progress. "The transformation which has made of disunited Germany, poor, undeveloped, stagnant, a World Empire rich in all the resources of material power, with commerce in every sea and territory in almost every Continent, is regarded by the politician and the man of affairs as a triumph of sagacious statesmanship and racial tenacity, and such a claim may be made justly." A century ago Idealism was supreme; half a century ago it had still not been dethroned; to-day its place had been taken by Materialism. "This," writes William Harbutt Dawson, "is not to say that belief in ideas is extinct, or that high thinking has passed out of fashion in Germany. Even to-day scholarship is nowhere held in greater

regard, learning is nowhere cultivated more resolutely and for its own sake than in that country. The Universities train from year to year a larger number of students than ever before, and if real or practical studies have to some extent challenged the supremacy of the old classical discipline in the scheme of Higher Education, it may safely be said that study is followed with all the old devotion and disinterestedness no less by the student than the teacher. Nevertheless, the dominant note of German life to-day is not that of fifty, or forty, or even thirty years ago."

Admitting the absolute justice of this criticism, as we are necessarily compelled to do, acquiescence with Dawson's formulation of the debt of the Modern Spirit to the inspirational impetus imparted by the four great masters in literary art and philosophical thought is no less necessarily insistent. It was the teaching of Goethe and Schiller, of Kant and Fichte, that helped more than anything else to nerve and pull together the Teutonic peoples after the humiliations of the Napoleonic era, that created the spirit of self-sacrifice which not only brought Germany out of its troubles, but made the triumphs of later years possible; *that originated the enthusiasm for education which caused Germany to be known as a land of schools*, and that lies at the heart of everything that is good and wholesome in the German Confederated Empire of the present day.

Nevertheless, a new spirit has entered into the national life. "If the first half of the Nineteenth Century witnessed in Germany the reign of Spirit, of ideas, the second half witnessed the reign of Matter, of things; and it is this latter sovereignty which is supreme to-day. A century ago Germany was poor in substance, but rich in ideals; to-day it is rich in substance, but the old ideals, or at least the old idealism, has gone." For instance, the great Professor Johann Gottlieb Fichte declared from his philosophical chair in the University of Berlin that "The airy theories about international trade and manufacturing for the world may do for the foreigner, and belong to the weapons with which he has always invaded us; they have no application to Germans; and that, next to unity amongst themselves, their internal independence and commercial self-reliance, are the second means to their salvation, and through them to the welfare of Europe." Of course, Fichte held that the first means to Germanic salvation, and through Germans to the welfare of Europe, was the divine knowledge of that Transcendental Philosophy, from the mysticism and vagueness and impracticability of which modern Germany has emerged into a new and practical and progressive modern world of competitive energy and material achievement. But Fichte has had his day. His dream of the preciousness of national poverty, linked with national spirituality, is untenable in a Twentieth Century of hard facts and vehement struggle. It has been pointed out, with modern emphasis, that Germany is what it is to-day because the strength, the ardour, the eagerness, which are inherent in the national character, yet of old were wont to embody themselves in ideal forms, have sought an outlet in new directions. It is the same Germany, yet in thought another; the same nation, yet its life and pursuits are different.

Dawson pertinently remarks that the comment of the practical man, on the transformation of Germany, is that material progress requires sacrifice of ideals, and that Germany would not have been able to claim a larger share in the world's life had it not been willing to forego something of the old self-culture. No one can help admitting the truth of this contention of W. H. Dawson. There is no doubt that the old Germany and the new Germany could not live side by side, and the old Germany has given way, the significance of the sacrifice being emphasised by its completeness and its deliberation. On the conclusion of the French War, an outlet had to be provided for the organised enthusiasm and energy of the Teutonic legions, and the Gallic myriads of ransom treasure provided the sinews of a new war of competitive Commercialism and Industrialism. The war, the indemnity, and the new Empire gave to the already initiated material enterprise a colossal impetus, which has hitherto carried the movement onward without check or hindrance. Dawson sagely remarks that one of the pregnant signs of the New Spirit which is dominant in German life is the materialising of Education—a tendency, however, by no means confined to Germany, nor even one in which that country has set the example. The movement began with an attack on the Gymnasias and in their discouragement in favour of the Modern Schools, and has since spread in many directions. "To-day the teaching of English is being fostered in the Secondary Schools of Prussia as never before ; yet let no one suppose that it is out of compliment to English Literature or for any intellectual or ideal reasons. In the Ministerial decree which supplanted French by English as a compulsory subject reference was made for propriety's sake to the value for literary and political reasons of the study of English, but the real motive was the practical one, the recognition that English is the language of Commerce and a knowledge of it the best key to the markets across the seas."

The trend of the German new outlook can be found in the words of Professor Paulsen, of Berlin, and no one has a better right than he to speak upon this subject :— "At the beginning of the Nineteenth Century, Speculative Philosophy was in the ascendant and with it went Humanistic Philosophy, both being one, in that their aim was contemplation. At the end of the Century, Natural Science was predominant, and Natural Science in the service of Technics and Medicine. One has only to note the increase of Technical Colleges and the expenditure which the State incurs on behalf of Science ; for new Institutes of Natural Science and Medicine new millions are always ready, but is any liberality shown towards the most modest needs of Philology or Philosophy ?" Professor Dr. Rein, of Jena, complains in the same strain. He writes :—"A onesidedness which only esteems material values, and an increasing control over Nature, is destructive in its influence, and this onesidedness set in during the second half of the Nineteenth Century in Germany. We Germans have ceased to be the nation of thinkers, of poets, and dreamers, we aim now only at the domination and exploitation of Nature." Another writer, a contributor to "Unser Kaiser und

sein Volk," assuming the name of "Schwarz-Seher" (Blacklooker, *i.e.*, Pessimist), affirms "that the active interest for Natural Science and Technical Improvements is not balanced by a deeper concern for the problems of the Mental Sciences and the Arts.

. . . We have indeed made progress in the domain of Industry, Commerce, and Material Life ; but, on the other hand, the old German quality of striving after the essence of things, the hidden soul of phenomena, and the delight in this endeavour—free from all secondary ends—is more and more being lost. . . . We have lost the old Idealism."

This philosophic wail is, of course, very natural from the representatives of the old classical school ; but the attractions of a commercial career offering high rewards and great possibilities of material advancement have exerted a strong influence even in bureaucratic circles, from the lower grades to the highest. So much so is this the case that the Public Service itself suffers, and the best men are lured away from it into the more remunerative arena of the Open Market. When in 1907 the Imperial Government was requested to take the initiative in establishing a Chemical Technical Institute, the Minister of the Interior replied that it would be impossible, unless the Chemical Industry largely supplemented such salaries as the Government might be able to pay the necessary staff. "In private undertakings," he said, "able technicologists and chemists receive salaries which we could never offer. I am at a great disadvantage that, in spite of all efforts, I am unable to secure for the Imperial Service conspicuous ability, simply because better remuneration is offered elsewhere."

Sometimes men of the highest accomplishments, and of the first flight in their professional callings, take service under Government ; but such instances are rare. On the other hand, a far larger number of men leave the State Service to take charge of large Industrial Companies or to enter their Directorates on very remunerative terms. The late Dr. Bödiker, the head of the Central Insurance Board, joined the firm of Siemens and Halske ; ex-Ministers have in recent years been attracted to the Directorates of another Berlin Electrical Company, and of Krupp's, at Essen ; other high Government officials have joined the Steel Syndicate and the Berlin Tramway Company ; and the Directorates of the two large Shipping Companies contain men who have, or who had, important connections with the Prussian Government, and even with the Crown.

It is naturally in the political domain that the tendency to worship force is specially seen. The cult of force is mainly but not wholly a political growth ; but it may manifest itself commercially, industrially, educationally. Prince Bismarck, with all his impatience with theory and contempt for the man of thought and contemplation, was the competent modern German personification of the doctrine of force. He was also its Chief Prophet. "Political questions are questions of power" was his fixed principle, and with it as a goad he rode roughshod over some of the most treasured traditions of political and economic thought. But, after all, and stated in different terms, Bismarck was only a seer who held an absorbing and dominant belief in the

efficiency of resolute action. Professor Paulsen has written, "Two souls dwell in the German nation. The German nation has been called the nation of poets and thinkers, and it may be proud of the name. To-day it may again be called the nation of masterful combatants, as which it originally appeared in history." Nevertheless, since 1860, Germany has not been engaged in a struggle waged consciously in the name and for the sake of Civilisation or in a struggle for intellectual or political ideals, or indeed for ideals of any kind. For the last half century the struggle in which Germany has been engaged is a struggle for sheer mastery in the realm of matter, and for political ascendancy among the nations. Yet no wilful disturbance of the world's peace need be apprehended from the Germans, for the economic conquests upon which their mind is set can only be achieved by peaceful methods, and this they know far better than some of the rivals whose trade they are capturing. Germany's industrial progress is no matter of profound mystery. It has been achieved by means and methods which are open to all the world if people will only employ them. Science, education, application, and a regard for small things equally as for large—such, in the main, are the causes of Germany's success as a rival in the markets of the world; and, speaking broadly, it is safe to say that where the enterprise of other nations has fallen back in those markets it has been owing to deficiency in one or other of these conditions—conditions upon which Germany lays especial stress.

Critics predict that German industrial competition, far from having reached its highest point, will in the near future inevitably increase its severity. One reason for this prognostication is the comparative youth of German industry; another is the fact that national thought and energy are being devoted to mercantile pursuits with a whole-heartedness witnessed in no other Continental country. This is not to say that the German industrialist and merchant are superior to their rivals, protest the British critics, although they do show an absorption in their callings which in these days is not everywhere fashionable. Further, it is considered that German industrial competition will be stimulated still more by the rapid growth of population and the absence of German Colonies suitable for settlement by Europeans.

The judicious observer reassures the British competitor, however, by the statement that hitherto the German industrialist has enjoyed specially favourable costs of production, notably owing to the lower wages paid and the longer hours worked; but the existing relationships between Capital and Labour afford no reason for assuming that this advantage will always continue in the same measure as hitherto, because, owing to a variety of causes, Germany is also fast losing its character as a cheap country; its people are no longer satisfied with the old simple life; they may have larger incomes than formerly, but they also spend more. This breaking with the old spirit of frugality and renunciation may imply a rising standard of civilisation. It is certain, however, that the effect is to increase such important elements in the cost of production as salaries and wages, interest and profit.

Pessimists, British Pessimists, of course, declare that the German Systems of Technical Education (which are incomparable as far as their purpose is the production of scholars or teachers, or of officials and functionaries, to move the cranks, turn the screws, gear the pulleys, and oil the wheels of the complicated national machinery), are nevertheless far from being equally successful in the making of character and individuality. This is, perhaps, an extreme of captious criticism. Dawson, in his illuminative work, says that as far as command over matter goes, the German is not merely good but unapproachable. Any work, any function that can be performed by system, he will perform as no other man on earth. His machinery will not always be the best, but in its own way it will work to perfection, and the finished product will be the best of its kind—that is, the best that such machinery can produce. Germany is the most systematised nation of modern Europe—socially, commercially, and industrially, as it once was the most drilled of all Old World conscript armies; but to-day the schoolmaster has usurped the post of the drill sergeant.

AUSTRIA.

Technical Education.

That vast congeries of States of complex peoples united under the leadership of Franz-Josef, Austrian Emperor and King of Hungary, makes provision for the Commercial-Industrial Education of their youth. As regards Commercial Instruction three types of schools are employed, namely, Commercial Schools of the highest grade, Commercial Day Schools, and Mercantile Continuation Schools. Under the first heading come the “Handelsakademien” of Vienna; of Lenz in Upper Austria; of Graz in Steiermark; of Innsbruck in the Tyrol; the German and Czechish Academies in Prague; the German Academy in Aussig; the Czech Academy, Crudin, Bohemia; the Commercial High School of Trieste; the Commercial Middle School of Trient; the Commercial Schools of Königgratz of Pilsen and of Richenberg in Bohemia; the Franz Josef Higher Commercial School of Brünn and the Higher Commercial Schools of Olmutz and Prossnitz in Moravia; the Higher Commercial School of Cracow in Galicia, &c.

The Commercial Day Schools are typically represented by such institutions as the Landes Handelsschule of Krems in Lower Austria; the Communal Commercial School of Wels in Upper Austria; the Commercial School of Klagenfurt in Kärnten; of Bozen in the Tyrol; the Communal Commercial Schools of Brüx, Budweis, Gablonz, Horitz, Melnik, Tepliz, Warnsdorf, in Bohemia; the Commercial Courses for Girls in Olmutz; the Commercial School of Troppau in Silesia; the Commercial Division of the Staatsgewerbeschule of Czernowitz in Bukowina; a number of private or semi-private Schools in Vienna, Prague, and other towns.

The Mercantile Continuation Schools are represented by fifteen such institutions in the Austrian Capital, Vienna, and its suburbs and immediate surroundings, four in Prague, six in Steiermark, and altogether sixty-one in Bohemia and twenty-two in Mahren.

It is worthy of record that the first Hungarian Commercial School was opened in 1830, and owes its origin to Emmanuel Bibanco, a Silesian schoolmaster. With the support of the merchants of Pest, this institution was established and maintained as a private Sunday School until the end of the first year, when it became a day school. Beginning with only twelve pupils, at the end of three years it had no fewer than one hundred. The Hungarian Law XVI of 1840 compelled every merchant to keep his books according to certain well-defined rules, and this helped to strengthen the teaching of Commerce. Commercial Schools were initiated about the same year in various other towns of the Empire. It is to be noted that in these schools, besides Hungarian itself, the Modern Languages of German, French, and Italian are taught, with English as an optional study. In the broad sense, the general instruction is not unlike that imparted in the Commercial Industrial Schools of Germany. The Counting House work is, however, very detailed, and the curriculum embraces such subjects as Political Economy, Arithmetic, and the Calculation of Probabilities.

Austrian Technical High Schools.

General speaking, the highest forms of Technical Education in the many States which contribute to the totality we term, rather loosely, the Austrian Empire, is to be found in the Science and Professional Courses of the Universities. The instruction is, however, rarely given with first regard to its application; hence Science Schools are not Technical Schools in the strict sense—as, for instance, they most undoubtedly are in countries like Germany, Switzerland, France, the United States, and even Great Britain. With this consideration in view, the various types of High Schools (that is of University Grade) that exist in Austria are as follow:—The Universities, the Technical High Schools, the High Schools of Agriculture; the Mining Academies, the Art Schools, and the Theological Schools. The Universities are those of Vienna, Graz, Innsbruck, Prague (Bohemian), Prague (German), Lemberg, Cracow, Gzernowitz.

The Technical High Schools are those of Vienna, Graz, Prague (Bohemian), Prague (German), Brünn, and Lemberg. The organisation in each is similar, and the instruction comprehends Civil Engineering, Architectural Engineering, Mechanical Engineering, Chemical Technology, and a Department embracing special subjects. In the High School of Agriculture at Vienna the classes are arranged under the general headings of Agriculture, Forestry, and Culture Technology. There are two Mining Institutes, namely, the Imperial Royal Mining Academy of Leoben in Steiermark, and that of Příbram in Bohemia. The latter has three departments, to

wit—(1) the General Division ; (2) the Professional School of Mining ; and (3) the Professional School of Metallurgy. The Austrian Art Schools comprise the Imperial Royal Academy of Vienna, the Art Academy of Prague, and the Art School of Cracow. The Art Academy of Vienna teaches the following courses :—(1) General School of Painting ; (2) General School of Sculpture ; (3) a special School for Historical Painting ; (4) a School for Landscape Painting ; (5) a School for Copper Engraving ; (6) a School for General and Medal Engraving ; (7) a School for Architecture ; (8) a School for Higher Sculpture. The general organisation of the Austrian Technical High School is similar to that of Germany, and the degree of Doctor of Engineering is conferred. The difference even between Austrian and Bohemian Schools is not marked. For example, the Departments or Sections of the Technical University of Prague are the Departments respectively of Civil Engineering, Architecture, Mechanical Engineering, and Technical Chemistry. The equipmental facilities in the different schools are by no means identical. While for the more elementary parts of the demonstrations and laboratory practice they are much the same, for advanced work they show marked difference. In the Technical University of Prague, throughout magnificently equipped, there is a complete plant for sugar manufacture in small quantities, while every branch and phase of the sugar industry is represented in its Museum. The sugar industry is locally very important, and it may be mentioned incidentally that the students are very adept in the construction of designs for sugar factories. In all the laboratories the equipment has recently been increased, and additions are always being made.

Technical Education in Bohemia.

The Czechs are without doubt the most interesting branch of the great Slavic family which has spread farthest to the westward. Driven forward by the Avari, they came in the latter half of the Sixth Century into the country known to us to-day as Bohemia. The Czechs are first mentioned by the earliest Russian chronicler, Nestor, who wrote during the latter half of the Eleventh Century. The language of this interesting people (a subdivision of the widely spread Slavic) is spoken in Bohemia, Moravia, and, with certain modifications, by the Slovacks in the northern parts of Hungary. In the Eleventh Century it began to be written in Roman characters. By Imperial edict, the language has been admitted in the Higher Schools, valuable remains of old literature have been discovered, and fresh literature has been largely produced. Poetry, Belles-Lettres, History, Archæology, and Science are assiduously cultivated, thus disproving the Germanic contention, already referred to, that a culture of pure intellect, of contemplation and ideal thought, cannot exist side by side with a highly technical and practical application of theoretical principles to industrial production, for, above and beyond all, the Bohemian is an art producer of the first rank and a technician in his own subjects that need admit no peer.

The industries of Bohemia are not only important, they are the most important of any in the entire Austrian Empire. Their chief seat is in the north of the country, and it is altogether computed that there are about 1,600 manufactories, whose yearly production is valued at £26,000,000. Reichenberg is the headquarters of the woollen, Rumburg of the linen, Schönlinde of the thread, and the Erzegebirge of the lace manufacture. There are calico print works on a large scale in Prague, Hirschberg, &c. Bohemian glass, which is not only the best in Austria, but perhaps the best in the whole world, is manufactured at Haida and several other towns. In addition to these, Bohemia has manufactures of sugar (from beetroots), leather, porcelain, paper, metallic wares, chemicals, and beer. Its Chambers of Commerce are at Prague, Reichenberg, Eger, Pilsen, and Budweis. Such industries, to be successful, involve by their practitioners the acquirement of a vast amount of technical knowledge, and an article in a recent number of "Nature" on the Prague Exhibition shows that the workmen of Bohemia are fully seized with the need of this description of culture.

The Technical Schools of Bohemia.

The great industrial expansion of Bohemia is attested by the Exhibition held in Prague during the past year. The writer of the article in "Nature" (September 3rd, 1908) does not hesitate to ascribe this to the excellent system of Technical Education which obtains in the country, the scope and character of the system being admirably displayed in a series of well-arranged exhibits. The writer finds, moreover, that the keynote of Bohemia's Technical System of Education is "specialisation"—a word which carries no terrors to the mind of the Czech, who is surprised that the exhibits from some of the special schools (such, for example, as those from an institution for training barbers) should excite the amusement of the visiting Briton. Nevertheless, the fundamental principle of the system seems to the writer of the "Nature" article to be sound. In Bohemia, he says, a boy's trade is fixed for him, and whether he be or be not apprenticed, he is definitely trained for that selected calling, albeit without too much insistence on theoretical principles. If the boy happens to be apprenticed, he has then the compulsory obligation of attending an Industrial Continuation School throughout the term of his apprenticeship. In these institutions instruction is given for about six to ten hours a week—on afternoons, or in the early hours of the evening, or on Sunday mornings—the course lasting from two to four years. In the event of the lad not being apprenticed he is enabled to attend one of the Special Schools (Fachschulen) in which courses are provided and definitely take the place of apprenticeship. The industries included within the scope of these schools are lace-making, wood-carving, carpentry, cabinet-making, the textile industries, basket-making, iron and steel work, engineering, masonry, glassmaking, the manufacture of hardware goods, electro-engineering, locksmithing, the construction of musical instruments, the jeweller's craft, the setting of precious stones, machine embroidery,

watchmaking, gunmaking, and the manufacture of sugar from beetroot. In short, Technical Instruction is given in all the theory and practice of the national industries of Bohemia.

The writer of the article instances as another interesting type of school that devoted to general handicraft, to which boys of twelve are admitted, the aim being the imparting of a better preparatory training for a trade or craft than is possible in the ordinary Elementary or Primary School. As in Germany great stress is laid on Drawing, and the boys are given practical instruction in the preparation of materials for wood and metal work. This preparatory training has proved so successful in countries like Bohemia, that an experiment on these lines is at present being conducted under the auspices of the London County Council.

Besides the Schools of General Handicraft and the Industrial Continuation Schools there are also Higher Industrial Schools for well-prepared pupils who require advanced training in Art, Chemical, or Textile Industries, Building or Engineering, while in the large centres of population there are Central Industrial Institutes in which research and similar work is carried out.

The writer further remarks that, "The Austrian System of Technical Education is of special interest at the present time, because there is undoubtedly a tendency in England towards a higher degree of 'Specialisation' in the work of Technical Schools." It is, moreover, being realised in Great Britain that an efficient system of Technical Education cannot be organised by the erection all over the country of Technical Institutes of the same type with similar classes and laboratories, and conducted by the same class of teachers. Some years ago, continues the writer of the "Nature" article, it was discovered that Mathematics could be taught for the practical purposes of engineers in a practical manner, and without a great deal of insistence on abstract principles, and since then a considerable amount of thought has been devoted to the special educational requirements of various industries involving technology. Besides which, by the way, the educative value of the technical processes themselves is being more fully recognised.

The writer of the article in "Nature" cites the fact of Mr. W. R. Lethaby, Professor of Design at the Royal College of Art, deprecating, in the course of a paper read to the International Drawing Congress, 3rd August, 1908, "elaborate approaches to a practical subject" at present in vogue. "The great end," said Mr. Lethaby, "was production. The great thing was the trade, the craft, and sufficient culture could be hung up to any sufficient trade. . . . All proper education was the proper opening up of a necessary and beneficent life occupation."

This, comments the writer of the "Nature" article, expresses in the clearest way the principle which appears to underlie the Austrian System of Technical Education. The principle may be stigmatised as Utilitarian, but any one who doubts the practical success of the system will be well advised to examine the contributions at the Exhibition

at Prague. This is cheering testimony, for it was long presumed that Germany held almost a monopoly on the Continent of Europe of efficient Schools of Technical Instruction.

RUSSIA.

Technical Education.

The scope of this monograph does not permit of a detailed examination of the condition of Technical Education in every European country. But as we have glanced at the subject as it affects one great branch of the Slavic race, namely, the Bohemian, it will not be useless to glance at the matter as it affects the greatest of all the Slavic peoples, that is, the Russian. It is, perhaps, wrongfully assumed that inasmuch as Russia is politically as socially reactionary, it must also of necessity be non-progressive, nay actually retrogressive, as regards Education. This, however, is by no means the case, for Russia is not by a great deal the least progressive of European countries in matters educational and in expert pedagogy. However backward in this respect the interior provinces may be, the City of St. Petersburg stands abreast with the foremost centres of the Continent in the matter of Secondary and Technical Schools, one of the finest of which is the Tsessarevitch Nicolas—a Technical School which supplies the educational needs of the apprentice to the handicrafts operating with wood and iron. This School is conjointly endowed by the Tsar, by the Municipality of St. Petersburg and by the Society for the Development of the People. The attendance is over 300, and the great majority of the pupils are bursars. In the Tsessarevitch Nicolas the entire details of a handicraft are thoroughly taught, and on the completion of the course the better operatives in woodwork remain yet another year in the Institution and in receipt of a good scale of wages. The work done by this class of mechanics touches a high standard of excellence and is a tribute to the value and thoroughness of the system of instruction, besides being ample evidence of its scope and efficiency. It appears somewhat incongruous to the inquiring traveller that a city like St. Petersburg, which possesses so many fine schools, is so difficult of entrance and exploration. Before the foreign visitor can gain access to the Russian Capital he must obtain official permission, and he is obliged to arm himself with a properly accredited passport for production on any and every trivial demand—an obligation which does not obtain in any other part of Europe. Nevertheless, Technical Education is at a high mark in St. Petersburg.

SWITZERLAND.

Technical Education.

That sane and observant writer, Charles Edward Russell, in his admirable world-survey—"The Uprising of the Many," indulges in veritable enthusiasm over the instructional methods of Switzerland. In the hardy and independent Helvetian Republic the "Common Good" is a doctrine of supremest sway. The Swiss, says

Russell; are the best educated people of Europe, and their Public School System is probably the finest in the world. This, writes our author, is a pre-eminent reason why the Swiss fare so well. Parents can, in some of the Cantons, send their children to private schools if they insist upon so doing, but the face of the Government and the force of public opinion are set sternly against the practice. In the Canton of Solothurn private schools are absolutely forbidden. In other Cantons a private school pupil must secure a formal permit from the local authorities, and in some Cantons he must pay a charge to the public funds. The idea is that the Public Schools are good enough for all, that rich and poor are to meet there on even terms, that the Public School is the nursery of Democracy and Patriotism; above all, that Democracy is the life-blood and strength and very soul of the Republic, and the Republic is Switzerland, and without the Republic Switzerland is nothing. Private Schools for Swiss Children are few in number, and such as exist are under the strict supervision of the State. In Switzerland a parent must send his children to school or go to jail. The Helvetian Republic spends over two and a quarter millions annually on its Schools, and its population is less than three and a half millions. The Army examinations show only twenty-four in ten thousand unable to read and write, and these illiterates are always the scattered dwellers on lonely mountain peaks. Books, pens, paper, drawing instruments, everything that the student requires at any stage of his progress, are furnished free in the Swiss Schools, which are also under strict medical supervision. The School children number about 600,000; but the State maintains besides 299 Trade Schools; 218 House-keeping Schools, and many Agricultural Schools. There are, too, the great Federal Polytechnicum at Zurich, and other Technical Schools maintained by the Confederation; while six splendid Universities—Bern, Geneva, Basle, Zurich, Lausanne, and Freiburg—and a College at Neuchatel complete the educational scheme. In the Polytechnic Schools tuition fees are nominal—about two guineas a year—and this charge is remitted in the case of poor students, while there is also a State fund to defray the expenses of the impecunious. To such the authorities say: "Here are certain sums of money to be given to you in your school course. When you leave this institution you will begin to make your way in the world. You repay it as you can, so that it may be used to help others situated as you are. But there is no compulsion about it." In practically every case the money has been repaid.

The Swiss System of Technical Education is distinguished, no less than the German, for its absolute thoroughness. The Swiss have the highest inspiration for cultivation in whatever line of life they may pursue for absolute efficiency.

Foremost in the Swiss Educational System stands the teacher with his splendid spirit of inspired missionising, and his devotion to his noble calling. This is evidenced in marked manner by his attendance during the summer vacation at the Ecole Normale (Lausanne) in the Canton de Vaud, for the purpose of becoming proficient in one or more of the different branches of manual training. These enthusiastic Swiss teachers,

in almost every case from small country schools, engage in a preparation in some branch of Manual Work, so as to improve the elementary tuition given in their schools and further to enable them to direct the efforts of those of their pupils who, having completed the ordinary school course, have no other or no better immediate opportunities for educational advancement. With this end in view, these teachers take courses in practical education (as regularly as the long vacation comes round), in Bookbinding, in Working in Wood, in Wood-carving, Modelling, &c. These teachers warmly emphasise the importance of this work as educational training, while at the same time pointing out its value as a contribution preparatory to the embracing of some craft or art—a matter which deeply concerns the majority of Swiss parents.

Swiss Schools of "Specialisation."

Among the Swiss Schools of "Specialisation" (using the word in the sense as determining the life-calling of the student) may be mentioned the Institute Agricole of Lausanne, the students of which College, chiefly the sons of men on the soil, work on their own farms during the busy season, and attend the Institute during the winter months. This establishment has an important influence on the manufacture of Gruyere cheese, which is carried on at Moudon—a village situated a short distance from Lausanne. New buildings to form a residential school were completed a few years ago, and to this Institution are admitted youths who have attained the age of 16 years, the course, which is one thoroughly practical, covering a year. The curriculum includes the general treatment of milk and cheese, simple analyses, and information on grasses best suited as fodder for cattle. There is nothing elaborate about the Institution ; but it is eminently practical and well calculated to subserve the ends for which it is intended.

The College of La Prairie, at Geneva, is a truly ambitious high-class and completely equipped Institution on its scientific and professional side. It is situated on a high part of the City, and the class-rooms surround an open square handsomely planted with trees. The courses of instruction embrace Manual Training in Woodwork, Art Classes, Modelling in Clay and Cardboard, Wood Carving, Advanced Training in Woodwork, Metal Work, and Masonry. The boys attending take courses from the ages of 14 years to 16, from 15 to 19, and from 17 to 19, according to the subject selected for study and expert training. There are ample supplies of lathes and working tools, the workshops are of adequate dimensions, and are both well ventilated and well lighted. The teacher of the Woodwork section is, by the way, of opinion that this branch of study and practice, including Wood-carving, is of greater educational value than Ironwork. The pupils operate from drawing plans made by themselves, and Sloyd forms part of the course. In the Art Classes originality in designing is greatly encouraged, and both designing and colouring from Nature are marked features of the College. In the Section devoted to Modelling in Clay and Cardboard the work

serves to indicate the combined operations of lads engaged in the Building Trades. For example, the same model will represent the united efforts of the bricklayer and the mason, the carpenter and the joiner, the slater and the plumber. Indeed the teacher in charge of this section is an enthusiastic advocate for co-operative study and practice. Moreover, the students are occasionally sent out to sketch a building, and are later on instructed to make a model from such a sketch in their laboratory. In the section dealing with Advanced Training in Woodwork the student is expected to draft his own design on large sheets of paper, and then to execute that design in wood. This work is in reality advanced scientific construction, and is closely connected with Architectural Ornamentation. In the Metal-work class the work done is largely in the medium of tin, and the trade of a tinsmith is thereby very practically taught. In the Masonry Class Drawing and Modelling from design form the chief practical work. Apprentices to the mason's craft in Geneva get the greater part of their theoretical instruction at La Prairie, while their practical training is obtained largely in the workshops of their employers. This is true also in a general sense of the other Building Trades of this city. La Prairie, Geneva, may properly be described as a Trades College. The work is so co-ordinated that when a boy goes through his course, theoretically and practically, he is well qualified for the craft of calling he has taken up, and there will have been no gaps between the stages, no overlapping, and no waste of energy or time.

There is in the Geneva Museum of Arts and Decorations a splendid aggregation of mechanical and engineering workshops. Here, too, may be seen some of the boring instruments used in driving a tunnel through the Cenis and St. Gothard Mountains. In the watchmaking shops (theoretical and practical), and in the branches of Mechanics and Horology there are a hundred students attending a five years' course. This takes the place of an apprenticeship and turns out skilled tradesmen who readily obtain employment on the completion of their course, with the command of full wages. The showroom of the College contains some magnificent exhibits of scholars' work, such as designs, drawings, models, parts of machines, &c.—all the result of the efforts and application of the students. Girls are employed to execute the finer parts of watch mechanism, and the students range in age from 15 to 20. The fees are very moderate, namely, five francs (about four shillings in British money) per month to Swiss students, and to foreigners twenty-five francs (not quite a pound sterling) per month.

Two fine types of the Lower Technical Institutions are those of the Swiss Capital of Bern, in the Apprentice School of that city, and of the "Technikum" at Winterthur, in the Canton of Zurich. Winterthur is a small but busy town, of which the great industry is the Iron Trade—particularly that Department engaged in the manufacture of machinery. The town possesses a fine Technical College, an ordinary Commercial School, and a Trades School containing a large machine shop wherein a hundred odd boys are occupied in acquiring the knowledge to fit them for the calling of Mechanical Engineers.

Indeed Switzerland is justly renowned for the educational provision it has made for its citizens. That provision embraces not only Primary, Secondary, and University Education, but also the lower and higher forms of Industrial, Technical, and Professional Training.

In the Classes for Girls the Domestic Economy, besides treating of the purchase and care of linen, lingerie, &c., washing, ironing, and repairing, pays special attention to the question of alimentation. The conditions and essentials of good food, its purchase and conservation, recipes for its cooking, &c. (involving the most ordinary and therefore the most important viands) of vegetables and fruit, are features of the Institutions known as "*Les Ecoles Complémentaires de Genève*," and throughout the subjects are treated as far as possible in the manner most directly conforming to the needs of the individual pupil. In the Secondary Rural Schools girls are taught the details of cutting out, sewing, washing, and ironing. In the "*Ecole Professionnelle et Ménagère*," Geneva, are taught such diverse subjects as French, German, English, Accountancy and Calculation, Commercial Geography, Domestic Economy, Conceptions of Science and Hygiene, Stenography and Typewriting, Law, Drawing and Geometry, Calligraphy, Millinery, Mending, Embroidery, Cutting-out, and Confection of Garments, Darning, Lingerie, the knowledge of Commercial Products, Gymnastics, Cookery, and Washing and Ironing. These schools embrace courses of a General, a Professional, and a Specialised Housekeeping character.

Among good examples of Swiss Lower Technical Instructional Schools may be mentioned the Trade Schools of Bern for Mechanics, Joiners, Locksmiths, Tinsmiths, &c. The Apprentice School in the Swiss Capital aims at making it possible for a youth to obtain a thorough knowledge of his trade, at giving young craftsmen at the termination of their apprenticeship an opportunity for obtaining a thorough, all-round, practical education in their craft, with a view to the development and consolidation of already acquired knowledge; at counteracting the prevailing tendency to employ foreign labour by placing native Swiss labour on a higher plane of mechanical skill; and at raising the character of artisans' work in general by theoretical, industrial, and thoroughly business-like education, and by a continuous investigation of new technical methods.

Another famous type of Swiss School finds its representative in the Federal Polytechnical School of Zurich, which is one of the most renowned Polytechnica, or Technical High Schools, in the world. It is magnificently equipped, thoroughly in line in the matter of the latest of appliances, and admirably qualified for all the objects for which it has been established. It is not here necessary to examine the details of its working, constitution, &c. It is sufficient to say that in general respects, curricula, discipline, fees, &c., it bears a marked resemblance to the best of Technical Colleges, as that of Charlottenburg in Germany. This remark relative to corresponding likeness is applicable also with respect to the Commercial Schools of the Swiss cities and towns

of Bern, Neuchatel, Geneva, Lausanne, and Winterthur, when compared with the Commercial Instruction Schools of Germany. Switzerland stands educationally on a very high plane. It has been stated by Mulhall that only 1 per cent. of the total population of the Helvetian Republic was illiterate, and even this low proportion of illiteracy failed as a reproach to the Educational System, and was due absolutely to unavoidable natural causes, such as remoteness and inaccessibility of residential conditions in far distant valleys and on unapproachable mountain heights.

AMERICA.

Technical Education in the United States.

"Cassier's Magazine" for November, 1902, was a special issue known as the "machine-shop" number. It contained two highly important articles, the one dealing with experiences in connection with apprenticeships in the United States, and the other of a similar nature with reference to Great Britain. It was clearly recognised that the conditions under which industrial operations take place to-day are materially different from what they were in the days of small establishments. The great advantage of the old apprenticeship system in its first form was that when the employer or head foreman was a man of skill and character, the boy was influenced by his personality in a favourable manner. But that influence is now a matter of impossibility on account of the great size and strenuous activities of modern works and factories. Under the present system the contact between master and apprentice is less personal, and, therefore, more mechanical. In an article in the magazine mentioned from the pen of E. S. Parks, M.E., of the Brown and Sharp Manufacturing Company, it is stated that "the Technical Schools have in a measure attempted to supply the lack of skilled workmen," that is to say, such workmen as were educated under the old system. "But," continues Mr. Parks, "the results, while excellent in many ways, do not bring out the class of men with the training and experience needed, so that at the present time it seems as though there were but one way to fill this want—that is, by *returning to the old apprenticeship system as nearly as it can be done in a large factory.*" It is admitted that it is impossible for the apprentice to be brought into close contact with the head of the establishment, any more than it is possible for each student in a very large institute of learning to be brought into contact with its director. Mr. Parks refers to the practicability of a competent instructor being profitably employed in attending to the instruction of apprentices. He writes:—

"This instructor can see to it that proper selections are made from the applicants; that they are given correct instruction in the shop; that they are changed about from department to department as time progresses; and he should be a man of character, to whom the boys can go for advice and counsel,

and who can look out for them in the many ways which will occur to anyone who is duly qualified to take charge of apprentices. A man qualified to fill such a position should be a man of executive ability ; should have a good knowledge of human nature ; understand the mechanical work that is being undertaken by the boys ; and have a patient spirit and gentlemanly bearing. And above all he should be thoroughly sincere, otherwise he cannot command due respect from the boys whom he is to guide. With the supervision of such a man it is possible to bring up young men who will be properly educated in the business, and not only fitted to do the ordinary work of the shop ; it will furnish foremen and those who may eventually become managers."

Mr. Parks made a special inquiry into the various systems of handling apprentices, and he states that there is a complete lack of uniformity among the different manufacturers of the United States. Some apprentices are hired in the same way as ordinary workmen ; there are no agreements and the lads are but apprentices in name. In other cases, however, apprentices are given a thorough education in the details of the work of the firm employing them. Among the apprenticeship systems examined that of the Baldwin Locomotive Works was deemed to be the best. There the apprentices are graded, and the class to which they are assigned depends upon their previous education. This plan is, it is admitted, suited only to large shops. For small shops Mr. Parks advocates the four years' course of apprenticeship. Under this arrangement, after a preliminary trial, the lads are expected to pay fifty or a hundred dollars (roughly, from £10 to £20) for the privilege of learning their trade. This sum it is suggested should be returned upon completion of apprenticeship, together with a bonus of a hundred dollars, in addition to any wages paid during the term, on the assumption that the wages paid to the apprentice during the last year of his articles should be sufficient for his maintenance. The plan of apprenticeship in the Baldwin Locomotive Works was drafted by Mr. N. W. Sample, and since these works employ over 10,000 men the garnered experience should be of some considerable value. The apprentices are divided into three classes, special prominence being given to educational qualification in the first and second classes, while the third class provides training for Technical School graduates, but there are nearly five times as many apprentices in the first two classes combined as in the third class. Mr. Parks writes :—

"The usual legal form of indenture is followed for the first two classes. The first class requires four years' service, and the age limit is placed so that the boys will finish at the age of twenty-one years. It is expressly stipulated that the apprentice must faithfully attend at least two evenings in each week during the first three years of his apprenticeship free night schools, such as during the first year will teach him elementary algebra and geometry, and during the remaining will teach him the rudiments of mechanical drawing. . . . It is understood that the apprentice already has a Grammar School education [Public

School in this State] or sufficient education to render it unnecessary that any provision should be made for his further instruction.

“ The second class requires three years' service and a High School training, the upper age limit being 18 years. During this service the apprentice must faithfully attend at least two evenings in each week during the first two years of his apprenticeship free night schools, which will teach him the rudiments of mechanical drawing.

“ All three classes are to be moved or changed in the shop ; the first two classes every three months, and the third class at its own request, subject to the approval of the Superintendent. In order to arrange the moving systematically and to keep a complete record of the work, the conduct and character of service of each, a blank form is used, which constitutes actually the ‘ dossier ’ of the apprentice during his trade-learning course.”

The whole question of the future employment of apprentices is determined by the need of the Company and the personal record above referred to, and any apprentice whose faithful study and evident value justify it may be passed to the third or Technical Class. There is a general understanding that at the end of the training the apprentice's position will be that which his records warrant.

The apprenticeship system of the Brown and Sharpe Manufacturing Company has been in vogue for more than thirty years. The admission is confined within the age limits of from 16 to 18 years, and the entrance requirements comprise physical soundness, good moral character, an educational status at least equivalent to that required for graduation in the Public Grammar Schools of the City of Providence, personal application, a probationary period of 480 hours' service, and (in the event of the probationary period being undergone with credit), the entering into an agreement for a term of four years, each year to measure 2,950 working hours. A point worthy of notice is that a graduate of the Providence Training High School, provided that he is well recommended by its Principal, may have his term of apprenticeship shortened at the discretion of the Company.

In this connection it is worthy of observation that in the large cities of the States a Manual Training High School, known also as a Technical High School, is as great a necessity as the Academic High School or College. The Technical High Schools are attended by pupils who have finished the Public Grammar School course, and the instruction given in them is free. The working of these institutions in such centres as Philadelphia, Springfield (Massachusetts), and San Francisco is admirable. San Francisco, with a population before the earthquake of about 400,000 inhabitants, has no less than eight High Schools, three of which are Manual Training High schools, one supported by the City, while the remaining two (the Lick and Wilmerding) are Trade Schools under separate Boards, being separate benefactions but having a common Principal. The Lick School is attended both by boys and by girls ; but there

is no co-education, as the work of each sex has a special bearing—the girls taking up the Domestic Arts (Cookery, Dressmaking, &c.), and the boys the Industrial Crafts (Building and Machine Construction). Boys only attend the Wilmerding School, and their special work is House Construction. The attendance at the Lick School is 500, and in the Wilmerding 150. The essential difference between the two institutions is the period at which “specialisation” takes place. In the Lick School a boy does not specialise until he has completed one half of the four years’ course. During his first year he works in wood and during the second year in iron, and then he selects the trade he intends to follow permanently. In the Wilmerding school the boy immediately upon entering embraces the occupation upon which he has determined as a life calling. On the completion of their courses, both classes of students enter on their trades as journeymen, with journeymen’s wages. There is no friction with the Trade Unions, who rather approve of the Institutions, while the numbers in attendance at the Schools have no great effect on the apprentice question. It may be said in favour of these Institutions that their teaching is more general and thorough in its character, and their students secure a far better idea of their trades, than do apprentices who, at least in the iron trade, deal only with one particular branch of their business during probably their whole course of training. Wilmerding School has been considerably enlarged, and the plans, &c., for the new structure were the work of the students of the Lick School, the actual construction (including excavations, brickwork, carpentry, finishing, &c.) being carried out by the students of Wilmerding, the students of both schools taking a special interest in the work which was the result of the labour of their own hands and the conception of their own brains.

The Trade Schools of America.

The Trade School in America is of comparatively recent growth, and while subsidised to some extent by the State Governments and Municipal Councils is generally the outcome of private benefactions. In the Eastern States special schools have been established in connection with the textile industry, and instruction is given in the theory and practice of cotton manufacture, the construction and operation of the machinery, and the artistic principles involved in the production of desirable and ornamental fabrics, while the practical portion of the instruction is gained in local factories. Other special schools in these States are intended for the benefit of artisans needing instruction in Painting, Drawing, Modelling, and Designing. In marine cities Naval Architecture is added to the curriculum. New York has a Trade School, liberally endowed by private philanthropy, with an attendance of 600 pupils, and a staff of thirty instructors. The day classes include Plumbing, House and Fresco Painting, Sign Painting, Sheet Metal Cornice Work, Bricklaying, Plastering, Carpentry, Steam and Hot Water Fitting and Electrical Work. A nominal fee is

charged for the tuition, and on the satisfactory completion of the course a diploma is issued. San Francisco has also two splendid Trade Schools endowed by private enterprise. It is impossible to avoid requoting the words of Mr. Charles Moberly Bell in this connection, when, as Chairman of the Eighteenth Ordinary Meeting of the British Royal Society of Arts he remarked that the millionaires of America had to think what they would do with their money, and as they could not buy peerages in the United States they endowed schools with their superabundant wealth.

It is useful in this place to note the essential difference between the German Continuation Schools and the later developments in America. In consists mainly in the fact that the Teutonic boy learns the practical part of his trade from the employer to whom he is apprenticed, and supplements this instruction at a Continuation School, which, in some parts of the Fatherland he must attend until he is eighteen years of age, while the American lad who attends a Trade School acquires the whole of his life calling, both theoretical and practical, from competent instructors within the walls of his school.

The Californian School of Mechanical Arts.

The Californian School of Mechanical Art is the gift to the Technical Education of the people of James Lick, a citizen of the "Golden State." A circular issued by the Board of Trustees states that "having been brought up in narrow circumstances, earning his living in early manhood as a mechanic, he sympathised with the struggles of the young for a place in life, and resolved to found a school where those who were dependent on themselves could receive such an education as would give them a foothold in the world." In the year 1875, this educational benefactor executed a deed of trust by which he conveyed to certain trustees a large amount of property for various purposes of public benefit, one of which was the School which was founded and endowed at a cost of 540,000 dollars (£112,500), and was directed to be termed "The Californian School of Mechanical Arts"—"the object and purpose of which shall be to educate males and females in the practical arts of life, such as working in wood, iron, and stone or any of the metals, and in whatever industry intelligent mechanical skill now is or can be hereafter applied; such institution to be open to all youths born in California." It was, however, not until 1895, twenty years afterwards, and owing to prolonged litigation, that the buildings were completed and the School was formally opened. In the year 1900, the Wilmerding School of Industrial Arts, a totally distinct endowment, was opened in the City of San Francisco on a block of land in close proximity to the Lick School. The management of the two Institutions took this step with a view to having the two schools supplement each other, and to co-operate educationally as far as possible. Later on this arrangement was still further extended by placing both Institutions under one Head Master, but still preserving the

two distinct trusts in the management. The Lick School's chief aim is expansion in the direction of the Machinery Trades, namely, Patternmaking, Model-making, Forge Work, Moulding, Machine-shop Practice, Electrical Construction, Machinery, and Ship Drawing ; while the curriculum of the Wilmerding School includes a long list of Building Trades, such as Carpentry, Bricklaying, Plumbing, Architectural Ironwork, Clay Modelling, Artificial Stonework, Wood-carving, Cabinetmaking, and Architectural Drawing.

The scale on which lower Technical and Industrial Education is provided in America is truly remarkable, and is an outward and visible sign of a deep-seated faith and conviction that practical education is essential to national success. The foundations of manual skill are laid in the Kindergartens. In towns with populations ranging upwards from 4,000 there are no fewer than 5,100 of these children's Schools, with 6,300 teachers and 94,000 pupils out of a total population of about 76,000,000 for the whole territory of the Republic. Manual Training in the Primary School carries on the work begun in the Kindergarten, so that the pupil, when he turns his attention to Systematic, Industrial, Trade, or Technical Instruction, is ordinarily well prepared and makes rapid continuous progress. There are a very large number of schools in the United States for the teaching of the Mechanical Arts, and the income of Colleges for Agricultural and other Industrial Education amounts to over two millions sterling per annum. It would be a task quite impossible to give a complete account of all the institutions in the great Republic for imparting Technical and Artisan Instruction. One of the most remarkable and perfect developments of the kind is, however, that of Tuskegee, in Alabama, for coloured people. Typical schools of the Technical description are the Pratt Institute, Brooklyn, New York, and the Trade School of the latter City. The Pratt Institute is really a large educational establishment with a number of so-called Departments, to wit, a High School, a Fine Arts Department, a Department of Domestic Art, a Department of Domestic Science, a Department of Science and Technology, a Kindergarten Department, and a Library Department—the last-mentioned having a stock capacity for 200,000 volumes. The New York Trade School, founded in 1881, affords young men, who so desire, an opportunity of acquiring a knowledge of a craft or manual trade. The prospectus states that “the apprentice system under which lads formerly learned a trade is practically a thing of the past. Conditions in all trades have so altered that very few employers now care to assume the responsibility of teaching a young man a trade.” The courses embrace such useful arts and crafts as House-painting, Fresco-painting, Sign-painting, Blacksmithing, Steam and Hot-Water Fitting, Bricklaying, Plastering, Sheet-Metal Working, Carpentry, Patternmaking, Printing, Electrical Work, and Plumbing. A very complete and exhaustive curriculum is provided by the Drexel Institute of Art, Science, and Industry, at Philadelphia, which has organised its teaching under no fewer than eighteen Departments.

Manual Training Schools in the Eastern States of America.

The system of Manual Training in the Primary Schools of America is on a properly co-ordinated plan ; and, as practically followed out, is the logical and natural sequence of the Kindergarten Schools. The work is continued in the High Schools of America, and in towns of any pretensions the Manual Training High School is an institution of importance equal to that of the Academic School. The State of Massachusetts, always in the van in matters pertaining to education, was the first to recognise the modern necessity of manual training in the High School curriculum. More than ten years ago, a law was passed in the State Legislature, mainly through the efforts of Frank Hill, Esq., Secretary of the State Board of Education and one of the world's foremost educationists, requiring every city and town of 20,000 people and upwards to maintain Manual Training as part of its High School System ; and in 1898, a clause was added requiring such communities to provide for this training in the Primary Schools also. The readiness and willingness of the American people to support what is good for their children are exemplified in a Report of the Massachusetts State Board (1899), which showed that not only had the law been complied with, but that a number of towns with populations under 2,000 inhabitants, who were not affected by the Enactment, had voluntarily provided for Manual Training High Schools.

These Schools exist in all the large towns and in all the cities throughout the United States, and are as much a part of the State Educational System as the English and Latin High Schools. They vary in number, from one in the smaller towns to as many as twelve in such cities as Boston and Chicago, and are, as a rule, under the control of the Local Boards of Education. They are Institutions altogether independent of other High Schools of the City ; their equipment is superb, and the education, as in all the Schools in the United States, is given free to the local children. The Manual Training or Technical High Schools are frequently designated as Mechanics Art Schools, because they have specially provided for courses developing the principles of the Mechanic Arts. The leading Boston School, which cost 300,000 dollars, is known as the Boston Mechanic Arts High School. Springfield (Massachusetts), in addition to a splendid Academic High School, supports a very superior Mechanic Arts High School. The Boardman Manual Training High School, New Haven, is the gift of a wealthy widow, who gave 70,000 dollars for a building, the City Board of Education furnishing the land and the equipment, and defraying the current expenses.

Several of the Academic High Schools of the United States (the English and Latin High Schools as they are called) are provided with a Manual Training Department. Work in both wood and iron is taken in some of these schools for boys, and clay modelling, carving in wood, and joinery for girls. The courses in these schools are somewhat similar. In that of the Manual Training Department of the High School of Lynn, near Boston, a three years' course is given in shop-work,

comprising the following subjects :—First Year : Joinery, twenty-eight weeks ; Wood-turning, twelve weeks. Second Year : Wood-turning and Patternmaking, twenty-three weeks ; Cabinetmaking, five weeks ; Forging, twelve weeks. Third Year : Tool-making, Tempering, Compounding of Metals and Alloys, Moulding and Casting, sixteen weeks ; Chipping, Filing, and Machine Work, twenty-four weeks. But there is variation in the curriculum according to locality, and to the size and importance of the place. Thus, for instance, the Central Manual Training School of Philadelphia, with a curriculum covering three years, has five parallel lines of study, grouped as follow :—(1) English Literature and Rhetoric, History, Political Economy, Civics, German, French, or Spanish ; (2) Mathematics, including Arithmetic, Algebra, Geometry, Trigonometry, Book-keeping, and Surveying ; (3) Science, including Geology, Botany, Physiology, Mechanics, Physics, Chemistry, Steam Engineering, and Electricity ; (4) Freehand, Constructive, and Architectural Drawing, Designing, and Modelling ; and (5) Tool Instruction in Joinery, Patternmaking, Wood-turning, Wood-carving, Forging, Tinsmithing, Soldering, Brazing, Ornamental Ironwork, Moulding and Casting, Vise-work, together with Applied Electricity and Mechanical Construction.

Evening Continuation Schools in America.

Including the divisions of Manhattan, the Bronx, Queen's, and Richmond, there was in 1900-1 a total enrolment in the Evening Elementary Schools of New York of 32,482 boys and 17,242 girls—a total of 49,724 ; the enrolment for the same year in the Evening High Schools was 12,578 ; the enrolment of adults (English-speaking) was 7,368 ; and the number of foreigners learning English was 21,345. The average attendance was very low, only one school showing 50 per cent. The City Superintendent, commenting upon this section of school work, said : "Much to my regret, I am unable to record any improvement in the regularity of attendance at Evening Schools. The most satisfactory parts of the work were the teachings in the Evening High Schools and the instruction given to foreigners in speaking and writing the English language." The Evening School term lasts twenty-four weeks in High Schools and eighteen weeks in Elementary Schools.

In the Evening Schools of Boston the term lasts from September to March, and the Evening Elementary and High Schools are open five evenings in the week ; two hours each evening. No child under the age of fourteen years is admitted to the Evening Schools. The term of the Evening Schools for Industrial Drawing begins in October, and continues for sixty-six working nights. No person is admitted under the age of fifteen years. Adult evening classes, intended specially for the poorer classes, are held in the Hancock School, Parmenter-street. The list of subjects embraces Cookery, Dressmaking, Embroidery, Millinery, Basketry, Book-keeping, French, and Singing.

The classes in the Evening High Schools, Springfield, Massachusetts, are well organised in one of the finest of modern school buildings. The courses cover Commercial and Industrial work. Co-education is general in this School, which numbers 300 pupils, and education is free.

Higher Technological Education in America.

The provision made in the United States of America for higher Technical Education is on a colossal scale, and its features show a certain independence of development which have commanded worldwide attention. As far back as 1893, Professor A. Riedler, a distinguished engineer in the "Technische Hochschule zu Berlin" reported on the Higher Technological Schools in a "Bericht" entitled "Amerikanische Technische Anstalten." At the time Professor Riedler reported for the Prussian Government there were fifty-two important institutions teaching engineering. The review of the type of work then done was taken into account in the development of the higher Technical Schools of Germany ; and, as a matter of fact, a feature of German and American Technical Education is the rapid reaction of one on the other. Americans make educational trips to Germany, and, conversely, Germans similarly visit America.

In providing a systematic general course of business and commercial training for its youths, the people of the United States of America again come very close to the high standards reached in Germany. Nothing in the way of "specialisation" is attempted in the Grammar Schools (Public Schools) of the States, but the pupil, on being transferred to the High School, has a choice of courses, of which one includes Commercial subjects. Every town of any importance has its High School, which may be either a purely classical institution, preparing its pupils for the College or the University ; or, as is more frequently the case, a school with both modern and classical sides, insisting on a certain obligatory course, but allowing its pupils otherwise to choose their own subjects. In the High Schools with elective courses the equipment in the Commercial and Scientific Courses is very superior. Indeed, there is wanting little in the United States scheme to render "specialised" education little short of perfection.

Technical Education in America.—Summary.

In conclusion, it is well to dwell for a moment on the distinctive points of Technical Education in America. The Manual Training High School, or Technical High School, which plays so important a part in American industrial life, is a Day Institution provided by the people of the United States for such of their boys and girls as can attend a four years' course of specialised study, between the ages of fourteen and eighteen years, and following on the completion of the ordinary Primary Course. The American people are so thoroughly awake to the advantage of this additional period of instruction, that the Manual Training High Schools are all well and even enthusiastically

attended. Neither the American parent nor the American pupil regards education as *un fait accompli* at the immature age of fourteen years. In the United States it is universally felt that a better educational equipment for the battle of life is necessary than that which is, unfortunately, regarded as sufficient for his English, and (we are sorry to be compelled to admit) his Australian cousin. The American, perhaps, more than, but at least equally with the German, is keenly conscious of the value of trained and educated brains. No matter how small may be the measure of his natural capacity, the American sacrifices everything of meaner worth in order to polish it, to specialise it, and to gain from the educational lapidary all the super-attractive value which the cut gem has over the rough diamond—intrinsically valuable, perhaps, but unmarketable on account of unseen facets, and a lustre unsuspected because unrevealed. Nevertheless, it must not be supposed that the curriculum is necessarily narrow and squint-eyed; that it sacrifices everything for a single aim, which would unquestionably mean the disturbance of social and civic equilibrium in the individual student. It is not so by any manner of means. There can, of course, be no question that the teaching in the Technical High Schools is, and was meant to be, in at least the more advanced classes, a preparation for industrial pursuits; yet it is also true that a very broad training is afforded on the literary side. The curriculum of these schools is opposed absolutely to any cramping or narrowing process, and is utterly antagonistic to a preparation along merely mechanical lines. It is quite sufficient to instance, in controversy of such an idea, the provision made for the instruction of classes in English, French, Mathematics, and in Science generally—courses which are common in all the schools; German and Spanish are occasional subjects; while all the institutions have the ordinary courses in Drawing, Workshop Instruction, &c.; and certain others provide courses for girls in Art and in Domestic Service, and Commercial Classes for both sexes. Referring specifically to this aspect of the instruction provided by the Philadelphia Manual Training High School, the Chairman said, “It is not the purpose of this School to produce mechanics any more than it is to produce any other class of specialists. What it aims to do is to surround boys with the realities of life in both thoughts and things, and to fit them more closely to their environment. It is a system of education which is perfectly general in character, and which is recommended with the same confidence to the future student of the humanities as to the prospective worker in force and matter.”

The Canadian Commissioner was no less seized with the practical aspect of the educational problem. When he returned home to the great Dominion, he specially recommended, “That, in view of the importance of Domestic Science and Art, and of Manual Training with its Technical extensions, the Legislature should for a time stimulate their introduction by a special grant, proportioned in each case by the magnitude of the undertaking, and limited only by its liberality and a due regard for other Departments.”

John Seath, Esq., B.A., High School Inspector of Ontario, Canada, compiled a Report on Manual Training as it was imparted to students in the schools of the United States. This Report contained also suggestions regarding changes in the course of study in the High Schools of Ontario. Among other highly important and interesting passages occurs the following reference to the introduction and maintenance of the Manual Training High School :—

“All this has not been accomplished without much effort and a large expenditure of public money, especially in the High Schools. Local sentiment, however, still varies from strong advocacy to antagonism, and, although in Massachusetts the general feeling has expressed itself in legislation as being favourable, the work of educating the people has still to go on even in this enlightened Commonwealth. It is well to note here that, while the Labour Unions still look askance upon Trade Schools, they are invariably favourable to Manual Training. As an illustration, I may record the fact that the last Annual Report of the Illinois Bureau of Labour Statistics recommends the passage of a law favouring the compulsory establishment of Kindergarten in towns of 5,000 inhabitants or over. In cities of over 20,000 people it recommends Manual Training Schools, and also suggests that provision be made for the training of Kindergarten and Manual Training teachers in all the State Normal Schools. A Bill based on these recommendations, and including Domestic Art, has just been introduced into the Legislatures. Still further, under date of 24th January, I find that the Building Trades Council and the Bricklayers' Labour Union of Chicago have petitioned the Board of Education to have their apprentices take Technical Training at the English High and Manual Training School of that City. This is also suggestive to Ontario.”

This shrewd observation of Mr. Seath emphasises, if that indeed were necessary, the enthusiastic readiness and warm-blooded willingness of the American people to support these Manual Training Schools, even under circumstances and conditions (as *vide* the Bricklayers' Labour Union of Chicago), which would in Australia arouse only intense suspicion and distrust in our own Trades Hall circles.

Mr. Inspector Seath, of Canada, was particularly interested in the working of the Manual Training Department at the High School, Lynn, near Boston. He found the instruction keenly practical. For instance, matters dealing with forestry were touched upon, just so far as they could be taken in conjunction with the course in wood. He noted, moreover, as a peculiarity of the school, the fact that the teachers of Manual Training took a share in the academic work in the High School proper, in English and Mathematics. Mr. Seath's opinion of the real value of these schools is very high. He writes :—

“As I have already said, these Schools are not regarded as Trade Schools either by their staffs or by the public, and I seldom heard the education they

give described as Technical. Both terms seem to be studiously avoided in this connection. It is always held that the Schools have as much claim to be considered educational as have the English or the Latin High Schools. They specialise in Manual Training ; the English and the Latin Schools in English and the languages. Indeed, it is maintained that the Manual Training Schools are more important educationally than are the other two classes of High Schools, for they educate the whole nature, the creative as well as the acquisitive powers. It is not, however, denied that in the later years of the work the courses are a direct preparation for the industrial pursuits, but it is pointed out that the courses in the other Schools are a direct preparation for the professions, and that the industrial arts have at least an equal right to consideration. Some of the Manual Training Schools, as for example, those in Providence and New Haven, may fairly be described as lower grade Technical Schools ; they emphasise the industrial aspect more than some of the others. Such schools supply a demand which the decline of the apprentice system and the marvellous progress of industry have of late years developed in the United States for Technical Training of a grade below that of the Schools of Technology. They prepare young men whose funds and time are limited, for positions as designers, draughtsmen, and superior workmen, many of whom eventually become foremen and managers ; and with the education they give, a man of ability may rise to any position in industrial life ; not all a man's education is obtained at School or College. It is, I should think, exceedingly probable that the Manual Training High School will develop more and more in this direction, especially in the smaller cities, where limited financial support will prevent a more complete subdivision of educational labour."

Mr. Seath proceeds to point out that an examination of the records of 700 or more of one of these institutions shows that 70 per cent. of its former students were engaged in pursuits in which was required a high order of intelligence, with skill of hand in dealing with force and matter. Already a large number of former students occupied positions of trust and responsibility as superintendents, managers, and foremen. These schools fostered also a desire for the higher learning. This was shown by the fact that twenty per cent. of the graduates became students in the Colleges, Universities, and Higher Technical Schools. Yet again, many of the students go into kindred commercial occupations (such as hardware stores, &c.), or become dentists, doctors, or lawyers. This, indeed, should be emphatic evidence of the great advantage to the student of this hand and eye training, together with a general acquaintance with industrial pursuits. Mr. Seath considers that the resulting sympathy with labour and respect for its achievements are not among the least of the recommendations of such courses for those whose occupations are of a more literary character.

The American educational system is flexible. It is adaptative to local needs, and it is responsive to local conditions. Australia is more than superficially a repro-

duction of America in its attitude of exploitation of a practically virgin Continent. It took the United States long and weary years to throw off the shackles of Old World conditionings, and Australia is similarly handicapped by the hampering traditions of an unadjustable past. The American, however, ultimately found out what he wanted, and the immediate measure of a manageable modicum of education which he could wield to the conquest of force and matter sufficed him until he had time for a more thorough culture of his latent mental powers. The Manual Training School, and the Manual Training Department of the High School gave the practical American the very Archimedean lever with which he was confident he could lift the universe of material use and want. The American has the weighing, calculating eye to perceive, and to perceive with justice, that a good practical, efficient, usable education is a national asset, and he computes it as such; and, what is more, his children are as keenly wide awake to this fact as he is. The Australian schoolboy who has not learnt the use of his hands is on the wrong educational highway, and his parents are no less befogged, inasmuch as they have not yet made this highly important discovery.

The Chairman of the Board of Public Education, Philadelphia, in presenting his Seventeenth Annual Report in 1902, put the whole question in a nutshell. He said :

“The institution has achieved the reputation of being one of the best exponents of the modern educational movement. The Manual Training School was the logical outcome of the demand for that kind of training by which young men could be put in closer touch with the needs of the present day. The inadequacy of the ordinary High School methods in preparing boys for life's problems was keenly felt long before the educational value of tool instruction was known. The opening up of new fields of employment by the development of new improvements, the immense strides in the modes of travel, the rapidity of the transmission of news, the revolutionising of the methods of the manufactures by improved machinery, the various uses to which electricity alone could be put, called for a class of young men educated not only along academic lines, but who were also trained to put ideas into concrete results. It was felt that if useful men were needed useful means should be employed for their training. ‘To bring Thought and Labour together; to make the Thinker a Worker and the Worker a Thinker’ was the problem to be solved by the founders of the movement, and the results have duly justified the wisdom of the experiment. . . . The object of a Manual Training School is the education of all the faculties, and not the training of any special group. The boy is trained æsthetically, mentally, and physically. . . . The School shall help each pupil to enter upon his advanced or special training with the best economy of time, and with a clear conception of his fitting occupation. It should be borne in mind that a Manual Training School is not a Trade School. The

name, unfortunately, is misleading. . . . It is, however, a name so firmly rooted in the School nomenclature of the United States that it would, perhaps, be unwise to attempt to eradicate it. It only remains to give the name a broader meaning, and to associate with it in the public mind the full scheme of High School culture of which it forms a part."

Benefactions.

Apart from the type of school we have just been considering, the State has its Continuation School (also free), and to many of the academic State High Schools a Commercial Department is likewise attached. Indeed, it is no uncommon occurrence, in travelling through the United States, to find an academic High School, a Technical High School, and a Trades Continuation School all in one town and all well attended.

Reference has, by the way, already been made to the endowment of the James Lick Trade School in San Francisco. In somewhat similar fashion the affiliated institution of Industrial Arts was founded by J. C. Wilmerding in the beginning of the year 1901. He provided in his last will and testament for the bequeathal of a sum of 400,000 dollars "to establish and maintain a school to be called 'The Wilmerding School of Industrial Arts,' to teach boys trades, fitting them to make a living with their hands, with little study and plenty of work."

A word of interpolation : Mr. Seath, in the highly valuable Report on Education in the United States which he made to his State Government, mentions that, while the Labour Unions looked coldly on the Trades Schools, they invariably favoured Manual Training. However, the New South Wales Commissioner, while in San Francisco, was particularly careful to ascertain the feeling that existed in that City among Labour Organisations with regard to the plan of instruction adopted by the two independent trusts controlling the Lick and Wilmerding Trades Schools. In the first place, he found that the popularity of the schools was unquestionable. An attendance of nearly 700 students amply attests the hold they have upon the people. In the next place, the schools have reached the class of students with whom the benefactors were in truest sympathy. The students of both schools, on the completion of their full course, are rated as tradesmen ; and the courteous Principal (George A. Merrill, Esq., B.S.) states that not only is there no friction between the Labour Unions and the Governors, but that the former give their support and patronage to both of the Schools.

Bequests and benefactions are a vehement and pleasantly insistent feature of America's educational history. As Sir William H. Preece, K.C.B., F.R.S., remarked, when addressing the British Royal Society of Arts on the 11th April, 1907 :—

"In America it is not so much by legacy that wealth is bestowed as by the living millionaire, who, perhaps, derives the greatest joy and satisfaction from his munificence, in distributing his surplus wealth for the good of others."

In an appreciative sketch of Mr. Andrew Carnegie, which appeared the other day in one of the journals devoted to Technical Education, occurred this passage :—

“The American has always been impressed with the idea that education is essential to the development of a nation. Land grants were instituted by Congress in 1786 for the maintenance of schools and of a literary institution established by the State. The Great Land Grant Act (Morrell) in 1862, apportioned 13,000,000 acres for this purpose, so that each State should found at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts . . . in order to promote the liberal education of the industrial classes. The Federal Government in 1890, allotted £5,000 a year to each State for this purpose.

“The total grants of land up to 1900 by the Federal Government were for—

Schools	...	...	...	...	67,893,919 acres.
Colleges and Universities	...	...	...	...	10,765,520 acres.
					78,659,439 acres.

and in addition 50,000,000 dollars in money.

“Fortunately for Americans, education has been kept outside politics, and it is not as with us the shuttlecock of party. It is recognised as their greatest national asset, and every citizen regards it as his duty to contribute to its promotion.”

Again, Dr. Walmsley asserts, in support of Sir William Preece, “The American nation, from its inception, saw that its chief asset was education, and ever since then they have been educating.”

Australians have, unfortunately, not yet awakened to the splendour and value of education as a national asset, though some have responded very nobly to its appeal. The great bulk of our citizens did not, however, incubate the great American conception as to the true meaning of a mighty system of national education—such a system as has made Germany, and placed America on a pedestal no less imperial in its significance.

Technical Education in Great Britain.

In “Cassier’s Magazine” for November, 1902 (a periodical already referred to in another portion of this monograph), appeared an article by F. Barter—a Member of the Institute of Naval Architects—on the Apprenticeship System in the British Royal Dockyards. In beginning this article, Mr. Barter wrote :

“The alleged decline of industrial supremacy has in recent years engaged the anxious attention of the people of Great Britain, and her foreign competitors have derived considerable satisfaction from the existence of such a belief. Two reasons have been persistently advanced as mainly contributory to this

state of affairs, namely, the evil influences of misguided Trades-unionism and the faulty methods practised in educating the workers in Technical matters,—*perhaps it would have been more correct to say, the absence of any method at all.*"

Mr. Barter then proceeds to point out in the clearest possible terms what may be called the natural limitations of an apprenticeship to a business firm. His remarks are well worthy serious consideration. He wrote as follows :—

"In the private shipyard or engineering works *the apprentice is regarded by his employers mainly in the light of a profit producer*, and in return for his services as such he is permitted to learn the business up to the point of making a workman of himself. In the Royal Dockyard, on the other hand, the apprentice is regarded in the light of a student as well as a 'trade' apprentice, and he is educated by the Government in both senses. Practically unlimited facilities are afforded him for the acquisition of the most useful education obtainable—scholastic as well as technical—the object and hope of the Admiralty being, of course, that they will be able to retain in their service those who have benefited most by such facilities."

Mr. Barter emphasises the fact that the additional advantages enjoyed by what are called "premium apprentices" in private establishments are usually of a merely departmental character; the lads go through the various departments, *but are practically left to their own resources as regards educational study*. The apprenticeship in the Royal Dockyards involves no premium, but merely the passing of a medical examination and a pass-certificate in the following subjects (the first three of which are compulsory, and the remainder theoretically optional), namely :—Arithmetic as taught in the Public Schools, cube-root excepted; Orthography, embracing two selected pieces of Dictation to be written in a given time; Writing—a paragraph containing a tabular statement of statistics; Geography of the world, with especial regard to Great Britain and her Colonies; English, analysis, syntax, etymology, &c.; English Composition to the extent of moderate proficiency; Algebra up to and inclusive of simultaneous and quadratic equations; and Geometry—Books I to III of Euclid, with deductions.

Evening classes are conducted by the Chief Draftsman in the Dockyards Drawing Office, attendance being *optional*. A year's attendance gives a right to selection for six months' day-instruction in the Drawing Offices, and apprentices with particular aptitude are often specially retained in the Drawing Office—"borne out on drawing duties." They receive appointments when vacancies occur, after passing a competitive examination in practical and theoretical Naval Architecture. This applies to the Shipbuilding Department, but the Engineering Department follows the same course.

Each division attends school for two afternoons and evenings a week for *general study*, and one evening for Science Lectures and Laboratory Practice, the Admiralty

supplying the text-books. The apprentices of the first and second years constitute the lower division, and those of the third and fourth years the upper division. Examinations are held every six months, and last from three to six days. Indolent apprentices and those who do not attain forty per cent. of marks are not allowed to continue. The subjects are as follow :—Lower Division, first and second year : Arithmetic and Mensuration, Algebra, Geometry (Euclid's Books I to VI, XI, XII, with deductions), Trigonometry, Statics and Hydrostatics, Physics (Light, Heat, Magnetism, and Electricity), Chemistry, French (optional), Geography and English History.

The subjects set for the examination of the Upper Division (third and fourth year) are :—Statics, Hydrostatics and Hydraulics, Dynamics, Applied Mechanics, Higher Algebra and Trigonometry and Elementary Conic Sections, Differential and Integral Calculus and Conic Sections, Descriptive Geometry (or Mechanism), Physics (Light, Heat, Magnetism, and Electricity), Chemistry, and Naval Architecture (or Engineering). The subjects set for the final examination, at the end of the fifth year's course, are :—A general paper in Elementary Mathematics and Mensuration, Statics, Hydrostatics and Hydraulics, Dynamics, Chemistry, Physics—(a) Heat and Light, (b) Magnetism and Electricity, Applied Mechanics and Graphical Statics, Descriptive Geometry, Advanced Algebra and Trigonometry, Conic Sections and Differential and Integral Calculus, Practical Physics, Heat, Combustion, and Metallurgy, Practical Shipbuilding, Ship-yard Machinery, Practice and Appliances, Ship Drawing, Laying-off, and Mould Practice. In the place of Descriptive Geometry, and the last five subjects of this list, Engineering Students take the theory of Mechanism and Machinery, Steam and the Steam Engine, Practical Engineering, Workshop Appliances and Practice, Mechanical Drawing, and the Designing of Machinery.

A testimony of interest is that “most lads of ordinary intelligence *will learn more of their business during the fifth and sixth years than during their first, second, third, and fourth years put together.*” Note well that these are absolutely the years of technical study.

It is said that “the private shipbuilding and engineering establishments of Great Britain, speaking generally, take little interest in the technical education of their apprentices,” and that they “cannot be expected . . . to put themselves to the expense of educating their apprentices as thoroughly as the Admiralty does,” and, further, Mr. Barter says :—

“There is no doubt that much of the existing pessimism as to the loss of commercial prestige with which Great Britain seems to be threatened would be removed if shipbuilders and engineers would take more interest in the intellectual welfare of their apprentices; or, for that matter, their employees generally. When this happens employers will find it as much to their profit as to their credit.”

Nevertheless, there are signs of redemption. In the month of July, 1900, the Technical Instruction Committee of the Corporation of Manchester issued a pamphlet on the scholarship scheme of Messrs. S. Z. Ferranti, Limited, Electrical Engineers, of Hollinwood, near Oldham, and this movement expresses merely a growing recognition of the necessity of *genuinely thorough* Technical Education.

The following extract from the pamphlet, which is from the pen of F. Brocklehurst, M.A., indicates the scheme :—

“In the first instance, the firm undertakes to move selected apprentices from one department to another in their works, including the drawing room. The selection of these apprentices is to depend upon their success at Evening Classes, combined with the recommendation for attention and steady work given by their foremen. In the second instance, Messrs. de Ferranti offer for competition amongst their most capable apprentices a Day Scholarship at the Manchester Municipal Technical School. This will be awarded to the apprentice who, being not more than 19 years of age, obtains the highest position in the Science and Art examinations of any given year, in a selected number of subjects which are of importance to the adequate theoretical training of an engineer. The fees of the scholar whilst in the Day Engineering Department of the Municipal Technical School will be paid by the firm, and they will also pay him his wages at the standard rate corresponding to his age. His continued enjoyment of the scholarship will depend upon satisfactory weekly reports of progress, and with the purpose of maintaining his close touch with his trade, the apprentice scholar will be required to work in the shop on all occasions of school holidays which are not works holidays. . . . Such are the main outlines of a scheme which, if it were universally adopted by employers, would, I make bold to say, completely revolutionise the relations between Capital and Labour, educate and elevate the character of the entire working-class population, and transform and modernise our methods of industrial production.”

It is to be noted that the *Technical Schools accomplish what the modern apprenticeship system fails to accomplish, namely, they enable men to discharge the far larger range of duties demanded in modern industrial activity.*

In this connection may be mentioned the action of Messrs. William Denny and Brothers, Shipbuilders, Dumbarton. *They refuse premiums, preferring apprentices with brains rather than those with money.* The Evening Classes in Science and Art at Dumbarton are largely subsidised by this firm, and apprentices are encouraged to attend, the fees being merely nominal.

A splendid feature of the new movement is the tendency to ask for higher preliminary education. Mr. Brocklehurst writes :—

“Messrs. de Ferranti are not alone in their endeavours to raise the mental and moral efficiency of their apprentices. Messrs. B. and S. Massey, of

Openshaw, are, I understand, willing to encourage the sons of workingmen to stay at school until they are seventeen years of age, by offering to accept them as apprentices at that period at the wage they would have obtained had they begun at fifteen. They ask that the boy shall first of all possess a good general education, and then gain a technical scholarship at the age of fifteen, which will give him free tuition at the Technical School, and an income of seven shillings per week during the next two years. . . . Let me for the moment suggest to employers the enormous powers they possess, and which, if exercised intelligently, would effect beneficent and far-reaching changes in every department of industry. Boys are plentiful in Manchester. Then why are employers content with inferior material? Let them insist upon an educational standard for their apprentices, and parents will soon see that their children conform to it. If, for example, a few of the leading firms of Manchester would refuse to allow a lad to enter their warehouses who had not passed through a Higher Elementary School, or attended technical instruction or commercial classes, they would attract the best of the youthful talent in the City; and the other employers, growing dissatisfied with the inferior leavings of the big firms, would also speedily adopt this educational standard."

In Great Britain it is recognised that it will take much strenuous effort over a long period to bring Technical Education methods up to the European standard; and it is the vivid recognition of this fact which makes such men as Lord Rosebery and Dr. R. B. Haldane, among others of light and learning, refer to Britain's national attitude towards education in language which savours almost of the *alarmist* type. Moreover, responsible committees are no less disquieting in their utterances.

Sir William H. Preece, K.C.B., F.R.S., maintains, moreover, that there is no cause for pessimism. At the Eighteenth Ordinary Meeting of the British Royal Society of Arts this gentleman delivered an address on "Technical Education in America," in which he dealt at length on the inspiring example placed before the world by the establishment of the Technical Schools of the Carnegie Institute of Pittsburgh, which were founded on the 15th November, 1900, and opened on the 11th April, 1907. The Institute began as a Library in 1892, with a gift of a million dollars (£207,500) from Mr. Carnegie, supplemented by another million dollars in 1895, and by subsequent donations which have now amounted to twenty million dollars (£4,015,000). Thus has the full, fine, and free enjoyment of Literature, Art, Music, and Science been placed within the unfettered reach of every citizen of Pittsburgh by one man's noble generosity and gloriously imperial beneficence.

In dealing with the condition of Technical Education in Great Britain, Sir William Preece remarked that it was remarkable that the British press gloried in bewailing an imaginary backwardness in its own country, and that this national depreciation was heard even within the walls of Westminster Palace. But, declared

Sir William, Englishmen had no reason to deplore the slow progress of Technology among themselves and their countrymen. It had certainly not been so liberal or so wide-reaching as in America, but the British Government and Municipal Authorities had been by no means niggardly all over the country. Indeed, the Government allocated about £1,000,000 per annum of the drink-taxes for this very purpose. "But," emphasised Sir William, "our complaint is that the wealth of our fortunate citizens does not flow freely in the direction of educational endowments. Notwithstanding persistent, and sometimes undignified begging, our ancient Universities themselves are sadly checked in modern progress by the want of funds and of patriotism in their alumni."

"It is," continued Sir William, "extremely difficult to obtain accurate statistics to determine the relative amounts of the immense sums of money bequeathed and contributed to religion, charity, hospitals, and Education in the United Kingdom. In London alone it was over £10,000,000 in 1906, but of this only £123,000 was allocated to Education. The total amount over the whole country must have exceeded £50,000,000, and of this probably only one per cent. was devoted to Education! Distribution of wealth is much a matter of fashion, and for some unaccountable reason Education is tabooed. Very recently Cambridge and Manchester have benefited largely, but this was accidental in the one case, and only a fraction of the immense sums left by Mrs. Rylands in the second case. In America it is not so much by legacy that wealth is bestowed, as by the living millionaire, who, perhaps, derives the greatest joy and satisfaction from his munificence in distributing his surplus wealth for the good of others."

A writer in the "Journal of the Royal Society of Arts," commenting (in the issue of the 10th April, 1908) on the difference between the different measure of encouragement bestowed on Education by Great Britain and the United States of America remarks:—

"Each State makes large appropriations for Schools and Universities, and most of the Universities obtain about 500,000 dollars (£103,750) per annum each. There are about 17,000 paid professors, lecturers, and teachers in the United States. . . . Canada is as liberal, and follows its neighbour and not its Mother-country, in this policy and fashion. The munificence of the millionaire has not been confined to the United States. Canada has her Strathcona, Mount Stephen, Redpath, Molson, and Macdonald."

And, we might add, with simple justice, Australia has her Sir George Grey, John Henry Challis, Sir Samuel Wilson, Mrs. William Hilton Hovell (widow of the famous Explorer of 1824-5), Solomon Levy, Thomas Barker, Sir Edward Deas-Thomson, Thomas Fisher, Sir William Macleay, Peter Nicol Russell, Sir Richard Dry, Sir Thomas Elder, Henry Tolman Dwight, Godfrey Howitt, Francis Ormonde, and Hugh Dixon.

The writer in the "Journal of the Royal Society of Arts" is far more pessimistic than Sir William Preece, who is mainly concerned that the educational endowments are so insignificant as compared with those bequeathed to charity, to the Church, and to hospitals, and who records his attitude as being, not opposed to hospitals, &c., receiving eleemosynary grants, but as objecting to only one per cent. going to Education, while 99 per cent. went to other purposes. The writer in the "Journal of the Royal Society of Arts," on the other hand, takes a view of popular and Technical Education in England which is well nigh alarmist. He extols the United States and Canada to the skies. He shows that Sir W. C. Macdonald has spent over £2,000,000 upon the McGill University alone in the development of its scientific and agricultural departments. America he regards as the first of all the nations of the world in its encouragement of Technical Education. He writes :—

"A smart boy in America can get his education practically given free up to twenty-two years of age. There is everywhere co-education. There is no residential system at the Universities. Accredited pupils can pass from the High Schools to the University without an entrance examination. There is a close and almost organic connection between academic and industrial life. Culture is not neglected as with us. Teachers are actively engaged in the practice of their professions. We do this in our Medical Schools only. Why should not the same be done in our Technical Schools? We have much to learn from American practice.

"A careful consideration of American practice develops some serious defects in our General Educational System.

"1. Children are removed too early from school. The limit here [in Great Britain] is eleven years, while in France and America it is thirteen, and in Switzerland fourteen.

"2. Science as a brain-trainer is not encouraged enough, and no effort is made to introduce it in our Primary Schools.

"3. There are too many academic traditions at home. Our ancient seats of learning want to be thoroughly shaken up, and a new race of teachers introduced. Exclusive cliquism has had its day.

"4. *Our Technical Schools are not sufficiently supported by our employers, and trained graduates are not welcomed in our works.*

"5. We want the fourth year for Technical Training and for Specialisation. At the end of the third year the student should know something of everything, but in his fourth year he should learn everything of something that is essential to his life-work.

"6. The Premium System is very restrictive. There are many exceptions, and the frequent intercourse with America is tending to the importation of American ideas. Head, Wrightson and Company's Bridge Works in Darling-

ton, and Allen's Engine Works in Bedford are very marked departures from the traditional British workshop. The latter firm has attached to its shops a collegiate course of training in Technology."

"No action of any association in promoting scientific training in this country has been more far-reaching than that of the Institution of Civil Engineers, which organised a much-considered scheme of qualifying examinations for admission into the Institution, and for promotion in its grades. I am glad to say that I took an active part in originating this movement, and it was the warm support of Sir John Wolfe Barry, and the spirited lead of Sir William White, that has brought it to a successful conclusion.

"Mere academic degrees are not alone sufficient to qualify an engineer to practise—he must have the credentials of actual experience. This is conveyed in the indications of corporate membership of the recognised Engineering Institutions of this country. The diploma of an engineer can be acquired only by practice and experience, and the admission to the Institution of Civil Engineers is now a diploma that no college or university can bestow.

"Thus, the effects of Technical Education are to protect the public, to economise labour, to prevent waste of material, and to apply the great principles of Nature, so as to give the greatest number the greatest happiness, comfort, and wealth."

In the foregoing, stress is laid on the tender age at which the English boy leaves school. This point is dwelt on at great length and much insistence by M. E. Sadler, M.A., in his "Continuation Schools in England and Elsewhere." He says:—

"In the United States far less has hitherto been done in the way of evening classes than in Great Britain or in France. This is partly compensated for by the fact that, in the more Progressive States, the mass of children remain at the Elementary Day School a year longer than is still the case in France or in England and Wales. But in the great cities of the Eastern States, and especially in Massachusetts, the waste of mental and moral power caused by lack of suitable training during adolescence is now recognised as a grave evil which impairs the social welfare of the community and threatens its industrial efficiency."

Sadler considers that the time has arrived when the national minimum of the school age should be raised. In the course of every year more than half a million children in England and Wales leave the Public Elementary Schools at thirteen or fourteen years of age. Not more than one out of every three of these children receives, in point of general or Technical Education, any further systematic care. Yet those who fail to receive such care, are, broadly speaking, those who need it most. And the years which immediately follow the day school are the critical years of adolescence when stimulating instruction, technical training and well directed guidance in matters

of conduct and personal hygiene are often most needed and, if wisely given, most helpful towards healthy living and self-control. Those whose work lies among boys and girls of this age, continues Sadler, especially in cities, lament the spoiling of promise and the waste of power which they see caused by lack of tendance and of invigorating discipline. Some economic changes have increased the mischief. It has never been so easy, as it is in England to-day, for a boy of thirteen or fourteen to find some kind of virtually unskilled work involving long hours of deteriorating routine, in which there is little mental or moral discipline, but for which are offered wages that for the time seem high and flatter his sense of being independent of school discipline and of home restraint. The work lasts for a few years and then leaves the lad at the very time when he begins to want a man's subsistence, out of line for skilled employment, and only too likely to recruit the dismal ranks of the unskilled labour. Certain forms of industry, which make large use of boys and girls who have recently left the elementary schools, are in part (except where the employers make special efforts to meet their responsibilities) parasitic in character and get more than they ought, and more than their promoters realise that they are getting, of the physical and moral capital of the rising generation. Many callings connected with transport and communication, and some branches of manufacture use juvenile unskilled labour to a degree which, if no counteracting measures are taken, must cause grave and lasting injury to the national life. And in this matter, great Government Departments are to blame. Sadler applies this remark to a marked improvement in the administration of the Post Office. He writes :—

“Almost as these words are being written, an announcement was made which encourages the hope that the Post Office will in future have more regard for the further education of the boys in its service. The *Times*, of October the 19th, contained the following paragraph :—

‘A problem which has long occupied the attention of those interested in educational matters seems at last to have found a solution. Many of the best lads attending the Elementary Schools throughout the country are attracted to the Post Office messenger service, because the pay is good, the uniform is smart, and the hours are regular. But, under present conditions, there is scarcely a chance of a telegraph boy's obtaining a higher position in the Service, since the postmen are recruited from the ranks of time-expired soldiers. The consequence is that these lads must go out as pages, hall boys, and errand boys, and later on obtain their living as best they can. Recently, with the approval and assistance of the Brighton Municipal Technical College Committee, a conference took place between the Principal of the College and the officials of the Post Office in the town, when the position of the telegraph messenger was discussed. The Postmaster undertook to see each messenger personally, and ascertain from him if he would be willing, facilities being given, to apply

himself to some definite trade or suitable study during his two years at the Post Office, and also to obtain the consent of his parents.' ”

According to the *Times*, the result of these interviews has been encouraging, a large percentage of the telegraph messengers have enrolled their names and chosen their subjects, among which may be specified such callings as Electrical Engineering, General Engineering, Carpentry, Plumbing, Typewriting, Shorthand, the Civil Service, &c. The Principal of the College submitted the scheme to his Committee, who, having a sufficient number of free scholarships at the Technical College, decided to present them to suitable Post Office messengers. The lads were to be kept under strict supervision, and their hours of duty at the Post Office were to be so arranged that regularity of attendance would be ensured. The Postmaster was to receive monthly reports as to the progress and conduct of the students, and prizes were offered for competition at the end of the session. It was suggested that Municipalities throughout the Kingdom should utilise their various Technical Schools for the same object, with the support of the various Postmasters. It was also suggested that in future telegraph messengers should be engaged only upon the condition that Technical Education should be compulsory during the two years that the boys are required, and that facilities be made for their attendance at the classes. The Postmaster at Stockport, by the way, had already taken action in the same matter some time before, and it was confidently expected that similar efforts would be made in other towns throughout the United Kingdom.

M. E. Sadler echoes the general opinion concerning European as contrasted with British Education. He writes :—

“ It is in Germany that the most systematic and (so far as can at present be judged) the most successful efforts have been made to grapple with the question of the further training of boys and girls who have completed the course at the Elementary Day School. After Germany, stands Switzerland. In Denmark more work has been done than in any other country to kindle national ideals and intelligent interest in co-operation among the country population.”

Some critics find in the efficiency of the German workman simply evidence of the educational value of compulsory military service. Thus Mrs. Birchenough, in the *Nineteenth Century* :—

“ It was impossible to walk about the great ‘shops’ (I use the word, of course, in its technical sense), filled with the busy throngs of men intent on their daily toil, and not to be struck, first of all, with their great superiority of physique and bearing to any similar collection of indoor workers at Home. It did not lie only in the straight, upstanding figures, the finely-developed chests, and well-carried heads which bore their obvious testimony to the results of military training. . . . No abstract views on the sin of militarism or the desirability of disarmament can affect the tangible results of development so plainly to be

seen. Over and over again official results show that the amount of work performed, and the individual efficiency of the workmen, varies in each State, exactly in proportion to the stringency of its laws for the enforcement of military service. Thus the German is more competent, and does a better day's work than the Belgian worker, whose service is more often evaded, and is, in any case, less thorough ; and so the scale varies in the different countries of Western Europe."

This, of course, reads like a plea for conscription in Great Britain. The United Kingdom has no system of compulsory military service, as we all know. But it is not, therefore, industrially inefficient. Mrs. Birchenough is quite unconsciously (and, from a superficial view-point, pardonably) illogical in assuming that the Briton is not a sufficiently efficient workman because he is *not* a conscript, any more than the German is a sufficiently efficient workman because he *is* a conscript. The German makes a good soldier, *because* he is a well-drilled workman. Military service becomes, in the hands of a German, only an extension of the principle of Technology. Moreover, some educational critics aver that military training is hurtful to the German workman, inasmuch as it robs him of the vital and resilient power of initiative.

In Denmark, France, and Great Britain, no effort has been spared by voluntary workers and by many public authorities in the organisation of classes, lectures, clubs, and institutions of all kinds for young people and adults. But in these countries success has been greater in the case of older students than in the case of boys and girls who have just left the Elementary Day School. It is at the very point at which work in the Continuation Schools is really continuative of what the Elementary has begun that the efforts of the British, like those of the French and Danish, have failed—albeit with some brilliant and fortunately increasing exceptions. In all civilised countries the problem of Continuation Schools is, therefore, engaging public attention with a clamant insistence; and everywhere along which expert educational thought is moving three termini are indicated, namely :—(1) the need for further limitation of the hours of juvenile labour ; (2) the necessity of legislatively placing all employers, including Government Departments, manufacturers, commercial firms, retail tradesmen, and employers of young domestic servants, under statutory obligation to enable these youthful workers of less than seventeen years of age, who are in their employment, to attend classes of technical and general instruction for four hours a week, at such times during specified days that the pupils may not be too tired to profit by the teaching ; and (3) the obligation of increasing the efforts made by the State to encourage local authorities and associations in organising (according to the needs of different localities and of different callings), courses of instruction which will be practically useful to young people of from fourteen to seventeen years of age, and so planned as to train them for healthy living and for the duties of citizenship. This holds true of Australia, as well as of all other civilised nations.

The first consideration instanced in the foregoing paragraph involves compulsory attendance—as to whether, as that eminent authority on Continuation Schools, M. E. Sadler, puts it:—

“It would be expedient to make attendance at Continuation Schools compulsory in England, and, if so, during what years, whether for girls as well as for boys, and whether in urban and rural districts alike, or only in those areas (whether in town or country) in which the local education authority should so decide.”

In this connection it is noteworthy that the London County Council is making its voice heard with no uncertain sound. The London Education Committee purpose spending a million pounds sterling during the ensuing eighteen months on Elementary and Secondary Schools; and the London School Board has adopted the principles of compulsory full attendance in the case of children up to fifteen years of age, and half-time attendance from the age of fifteen years to that of eighteen. This regulation, as might have been expected, has caused an outcry, because it is presumed that it will cause a scarcity of office-boys and messengers.

Technical Education a National Necessity.

It is everywhere recognised that Technical Education is a national necessity; but it is a singular fact that while one great branch of the English-speaking peoples (the American) makes large provision for securing this inestimable boon, the other (comprising Great Britain herself and her South African and Australasian Colonies) has not yet awakened to the full measure of its educational responsibilities. Technical Education, in order to fulfil its function in any community, must meet the needs of all classes of industrial workers and of those charged with the professional and scientific control of the various energies and operations carried out by them. To provide instruction for the training of the more numerous class—namely, the workmen, artisans, &c.—is not sufficient; training must extend to the highest planes of human effort, and qualify for that guidance without which the actual labourer's efforts cannot attain their destined end. This second class is, necessarily, relatively small in number, but the education of its component units is of the very highest importance. In this connection it must be remembered that in our productive activities we are in imperative competition against all the civilised races of mankind, and our very existence as a nation must ultimately depend upon the excellence and wise direction of our wealth-producing powers and resources. From this point of view only can be glimpsed the tremendous significance of General Education and the complementary value of Technical Education. It is, moreover, necessary to remember that from the lower to the higher grades of Technical development we are depending and dependent upon the preparation which has already been made, or supposed to have been made, in the Kindergarten, and in

the Primary, or in the Primary and Secondary Schools—according to the age at which the departure from General Education, and the taking up of the initial stages of Technical Education, has been made.

The London County Council, deeply seized with the great significance and overwhelming importance of this vitally national consideration, appointed, in connection with its Board of Technical Education, a Sub-Committee to investigate the whole question in relation to its application to Science and Industry. That Committee brought forward evidence of calamitous loss of business and falling off in industrial efficiency through national negligence of general and Technical Education. The Committee had the evidence of the ablest men in England to guide its work of investigation. These men were familiar with Europe in every educational, industrial, and social aspect. In many cases they were intimate with the leading members of the teaching staffs of European Universities and European Technological Institutes. These men were also linguists, and had come into verbal and personal contact with the educational experts of Europe, and into close touch with European sentiment and tradition. Among such high-class witnesses may be cited the following:—J. W. Swan, F.R.S. (Electrical Engineer, President of the Society of Chemical Industry); Sir Bernhard Samuelson, Bart., F.R.S.; Sir Henry Roscoe, F.R.S. (Vice-Chancellor of London University; Emeritus Professor of Chemistry, Owens College, Manchester); Dr. Frank Clowes (Chemist to the London County Council; Emeritus Professor of Chemistry, University College, Nottingham; President of the Society of Chemical Industry); Professor James Dewar, F.R.S. (Professor of Chemistry at the Royal Institution and Director of the Davy-Faraday Research Laboratory; President of the Society of Chemical Industry); Dr. J. T. Merz (Chemical Manufacturer, Newcastle-upon-Tyne); Dr. W. H. Perkins, F.R.S.; Professor Sir William Ramsay, K.C.B., F.R.S. (Professor of Chemistry, University College, London); Thomas Tyrer (Chemical Manufacturer, London; President of the Society of Chemical Industry); Professor Mendola, F.R.S. (Professor of Chemistry, Finsbury Technical College); George Beilby (Chemical Manufacturer, Glasgow; President of the Society of Chemical Industry); Dr. T. E. Thorpe, C.B., F.R.S. (Principal of the Government Laboratories, Foreign Secretary of the Royal Society, formerly Professor of Chemistry, Royal College of Science; President of the Society of Chemical Industry); Professor W. E. Ayrton, F.R.S. (Professor of Electrical Engineering, City and Guilds of London Central Technical College); Professor H. E. Armstrong, F.R.S. (Professor of Chemistry at the City and Guilds of London Central Technical College); J. Leinstein (Manufacturer of Coal-tar Products, Manchester; President of the Society of Chemical Industry); Alexander Siemens; Hugh Bell (Ironmaster, Middlesbrough); Principal Sir Arthur Rücker, F.R.S. (Principal of London University); Herbert Jackson (Assistant Professor of Chemistry, King's College, London); A. G. Green (Consulting Chemist, London); and Dr. Gordon Parker (Principal of the Herold's Institute, Bermondsey); while

written reports also were received from Professor M. J. M. Hill, F.R.S. (Professor of Pure Mathematics, University College, London); Professor Cormack (Professor of Mechanical Engineering, University College, London); Professor Fleming, F.R.S. (Professor of Electrical Engineering, University College, London); and Professor Lunge (Professor of Chemistry, the Polytechnic, Zurich).

One of the witnesses, J. W. Swan, F.R.S., called attention to the state of Technical Education in the following terms :—

“One of the most pressing requirements of the moment, demanded not only in the interests of chemical industry, but in that of our manufacturing industries generally, *is adequate endowment and encouragement of research.* Original scientific research is the fountain-head of new knowledge, the vital stimulus of industrial growth, the originator of new industries and sustainer of old. *But, nationally, in the organisation of our educational and industrial system, we give to scientific research no hospitality*—we barely pay it the respect of recognition. . . . To remedy the existing defects, if you have power to spend large sums of money on behalf of industries, you cannot do better than spend it lavishly. The most pressing need is to help London with University Education. *Comparing our teaching with that in other countries with which we are in rivalry, we stand nowhere.* The Universities in America have recently received £13,000,000 sterling for education, and that has all been expended in building and equipping institutions, and in endowments, thereby reducing the cost to students. Similar advances have been made in Germany and France; hence the wonderful growth of industry abroad. England is doing comparatively little in the way of education, and her trade is declining, whereas America is doing a great deal, and her industries are flourishing. *Education and success in industry cannot be dissociated. We must repair the negligence of the past, or we must submit to national decay.*”

Professor Cormack declared that :—

“All branches of electrical industry depend for success and development on scientifically-trained leaders. As an example of our (Great Britain's) unreadiness, I would quote the progress of dynamo construction. Dr. John Hopkinson laid down the principles of scientific design. America and Germany had men ready to understand and apply them, with the result that *we are now practically 'copying' their methods and their models.* In electric traction we are also behind, for similar reasons.”

Professor Fleming, F.R.S., put the matter very strongly when he says that :—

“*At University College, London, for instance, the present provision is not equal to that in a third-rate German or American Technical College.*”

Yet that College (that of London) has very eminent teachers. It is this fact of indifferent equipment, and an educational system which does not satisfy the require-

ments of preliminary qualification for higher scientific studies, which so seriously prejudice Great Britain's national efforts.

Notwithstanding this chorus of pessimism, however, Sir Bernhard Samuelson, Bart., F.R.S., strikes a more hopeful note when he says :—

“ I believe that employers have, within the last ten or fifteen years, become keenly alive to the value of Technical Training on the part of those occupying the higher posts in industrial works, and that they will be grateful to the London County Council for anything it may do to encourage and promote such training.” Sir Henry Roscoe, F.R.S., declared that—

“ The successful development of chemical industries in Germany is largely due to the fact that *men of high culture, who have had a scientific training, have been engaged as leaders of these industries. English manufacturers are less appreciative of the importance of a high scientific training than those abroad.*”

It is, however, not necessary further to recapitulate the views of these eminent scientists and experts. It is sufficient to note that there was a universal consensus of opinion as to the national necessity of fostering Technical Education if Great Britain wished to escape absolute and complete extinction as an effective industrial competitor in the open arena of the markets of the civilised world.

Evening Continuation Schools in England.

The Continuation Schools held during the evenings, in such English towns as Leeds, for example, have for their aim the carrying forward of the education given in the Day Schools, and the preparing of students for profitably taking up the work of the Higher Grade Commercial and Artisan Evening Schools. The courses of instruction embrace Reading, Writing, Composition, Arithmetic (with Mensuration), English History, Geography (with Lantern Lectures), Ambulance, Drawing, Singing, Woodwork, Wood-carving, and Clay-modelling; and, in addition, for the instruction of girls, Cookery, Needlework, Dressmaking, and Millinery. No pupil is admitted under the age of twelve years, and no day-pupils are enrolled. The nights for tuition are generally three a week, and the hours about two during each evening, though there is a variation according to the centre in which the Evening Continuation Classes are held.

Educational experts do not regard with much favour these exclusively evening conducted Continuation Schools, however. M. E. Sadler, in his exhaustive book on the subject, remarks :

“ The reasons for the prevalence of evening classes in English education may thus be traced to our long-continued backwardness in organising Elementary Day Schools (itself the result of an even balance between conflicting theories and the social organisation of our national life), and partly to the social and economic disturbance produced by the Industrial Revolution.”

Sadler tells the origin of one of the earliest Night Schools in Great Britain. This institution was established by David Dale, the father-in-law of the famous Robert Owen, for the children employed at the New Lanark Mills. It was an admirable institution. In the words of Robert Owen :

“Nothing, in short, at first sight, seemed wanting to render it a most complete charity. But to defray the expenses of these well-devised arrangements, and support the establishment generally, it was absolutely necessary that the children should be employed within the mills from six o'clock in the morning till seven in the evening, summer and winter ; and after these hours their education commenced. The directors of the public charities, from mistaken economy, would not consent to send the children under their care to cotton mills, unless the children were received by the proprietors at the age of six, seven, and eight. And Mr. Dale was under the necessity of accepting them at those ages, or of stopping the manufactory which he had commenced. It is not to be supposed that children so young could remain, with the intervals of meals only, from six in the morning until seven in the evening, in constant employment on their feet within cotton mills, and afterwards acquire much proficiency in education. And so it proved ; for many of them became dwarfs in body and mind, and some of them were deformed. This labour through the day, and their education at night, became so irksome that numbers of them continually ran away.”

At the age of fifteen or sixteen years, or it may be later, the Leeds pupil who has completed his course in the ordinary Continuation School may pass either to the Higher Grade Evening Commercial School or to the Higher Grade Artisan School. If his bent be in the direction of the former, his studies are designed to prepare him for a position in a warehouse, counting-house, or similar place of business, as clerk, cashier, book-keeper, or as general and foreign correspondent. The courses of instruction are of a thoroughly practical character, and include Book-keeping, Business Methods (Commercial Correspondence and Office Routine), Commercial History, English Literature, French, and Shorthand. English Composition, and Arithmetic, together with Handwriting, Figuring, and neatness in setting out work, are mentioned as requiring careful teaching by those in charge of the classes. After one or two years in these Higher Grade Commercial Schools (of which there are ten in Leeds) a pupil should be eligible for transfer to either the Central or Cockburn Higher Grade Evening School. A pupil attending any one of the ten schools specified has the privilege of joining, free of charge, classes in Singing, Clay-modelling, Wood-work, Wood-carving, and Art.

If, however, a boy's inclinations lie in the direction of industrial work, he may pass from the ordinary Continuation School to a Higher Grade School for Artisans. There is only one Artisan Evening School in Leeds, and it provides courses of

instruction for youths engaged in Engineering and Allied Trades. The syllabus includes Workshop Arithmetic, Practical Mensuration; Elementary, Geometrical, and Machine Drawing; Elementary lessons in Mechanics; English Language and Composition; and Wood-work and Metal-work.

In the Central and Cockburn Higher Grade Evening Classes for Commerce, Languages, &c., specialised courses of study are now introduced "to (a) enable persons who are entering upon a commercial career to obtain an intelligent knowledge of the work they will be required to perform during the first few years in a business house; and (b) to enable junior clerks and the sons of business men to acquire information which will be of practical use in their work, and the knowledge which it is essential they should possess if they aspire to higher positions. At the present time there is a want of Englishmen speaking and writing Modern Languages, and thus capable of representing English firms on the Continent, or of conducting home correspondence with foreign houses." The classes in actual working order are Book-keeping, Accountancy, Business Methods, Shorthand, Typewriting, Commercial Arithmetic, Commercial Geography, English, French, German, Spanish, Latin. The Central Higher Grade Evening Schools include classes for Dressmaking, Millinery, and Practical Cookery.

When a lad has completed his course in the Higher Grade Artisan Class he may pass to either the Cockburn Higher Grade School or the Leeds Institute. The subjects of instruction in these places embrace Workshop Arithmetic, Practical Mathematics, Practical Plane and Solid Geometry, Machine Construction and Drawing, Mechanical Engineering, Applied Mechanics, Theoretical Mechanics, Steam and the Steam-engine, Building Construction and Drawing, Brickwork, Masonry, Carpentry and Joinery, Hygiene, Practical Physics, Electric Lighting, Lighting and Power Transmission, Chemistry, Physiography, and Art. The subjects are arranged into two courses—one in Engineering, and one in the Building Trades—and certificates of study are issued on the termination of either course. Provision has been made also in the Cockburn Higher Grade Evening School for instruction in Practical Cookery, Dressmaking, Millinery, and Sick-nursing.

In Birmingham, the School Board of that city has also instituted Evening Classes in order to provide Day School pupils with "every facility for carrying on their studies," and in "the hope that they may be materially assisted in preparing themselves for their future career in life." Adults are eligible; and the curriculum for males embraces Arithmetic, Book-keeping, Mensuration, Reading, Science, Shorthand, Woodwork, Writing, Commercial Correspondence and Office Routine, Geography, Ambulance, Drawing, Metalwork, and French; while that for girls deals with Arithmetic, Book-keeping, French, Shorthand and Needlework, Dressmaking, Vocal Music, Cookery, Laundry-work, and Commercial Correspondence and Office Routine.

In Manchester, the School Board in 1902 divided its Night Classes into Evening Continuation Schools, Evening Science and Art Schools, Evening Commercial Schools, and Evening Institutes for Women and Girls; but the co-ordination is not so well defined as that obtaining in the Leeds system of evening educational work. Such elementary subjects as Reading, Recitation, Writing, Composition, and Arithmetic are taken in all these schools; while only in certain of them are the following dealt with, to wit:—The English Language, Geography, History, the Life and Duties of the Citizen, Elementary Chemistry, Magnetism, Book-keeping, Shorthand, Drill, Drawing, the Tonic-sol-fa Notation, Domestic Economy, Needlework, a Sewing Course, a Knitting and Mending Course, Cookery, Dressmaking for the Seniors, and Drill; the subjects being classified in five groups, namely, Elementary Subjects, English Subjects, Science Subjects and Subjects of Practical Utility, Vocal Music, and Special Subjects for Girls and Women.

The control of some of these schools has recently been transferred to the Technical Instruction Committee of the City of Manchester Council, and the Evening Science and Art Classes are now conducted in the Municipal Schools of Technology and Art. In the two Evening Science and Art Schools still under the control of the City of Manchester School Board the subjects of instruction are as follow:—Human Physiology, Building Construction, Organic Chemistry, Practical Plane and Solid Geometry, Hygiene, Machine Construction and Drawing, Magnetism and Electricity, Mathematics, Physiography, Physics, and Mechanics; while the following groups form the course of study in the Municipal School of Technology, namely, Pure and Applied Mechanics, Mechanical Engineering, Architecture and Builders' Work, Municipal and Sanitary Engineering, Physics, Electrical Engineering, Pure Chemistry, Applied Chemistry, Photographic and Printing Crafts, Textile Industries, Dress-making, Art Classes, and miscellaneous subjects.

The Commercial Evening Schools of Manchester, which are under the special ægis of Sir Philip Magnus, the author of a work on "Industrial Education," are of a very high type, and prepare candidates for examinations instituted by the Chartered Accountants, the Incorporated Accountants, the Institute of Secretaries, the Institute of Bankers, and the Institute of Actuaries. Among the languages listed in the curricula of these Manchester Central Evening Commercial Schools, Danish, Italian, Modern Greek, Portuguese, Spanish, and Russian find a place, as well as French and German. There are also Evening Institutes for Women and Girls in Manchester, devoted to Higher Grade Technical Instruction in the domestic arts and crafts. Says M. E. Sadler:—

"The success of the School Board in maintaining these Evening Schools would, however, have been impossible without the active co-operation of many of the Day School teachers. The wise policy was followed by giving the Head Master of the Day School charge of the Evening School conducted in the same

building, and in most cases these Head Masters took up the work with a keen sense of its importance. With the assistance of an energetic and loyal staff they devoted time and labour to the solution of the various problems that confronted them. In the first place, the task of keeping an Evening School together, and of adapting the methods of teaching and discipline to the needs of evening students is one requiring, not only considerable personal gifts, but also patience and laborious effort. But again, if an Evening School is to be successful, the Headmaster and his staff must not only teach, they must also know how to attract the students. This can be done only by much personal influence and constant attention to individual cases. The Head Master in particular must not rest until there has grown up among the children in his Day School a traditional custom of joining the Evening School on leaving."

Sadler has much praise for the Manchester Continuation Schools, and asserts that the success of the School Board in their maintenance is a credit, not alone to Municipal and civic effort, but also to the intelligence and enthusiasm of the students. He writes :—

"Here, as in other places, young men are found who, after a hard day's work, spend their evenings in fitting themselves, by real intellectual labour, for further responsibilities. Many of the girls and young women employed in offices are equally earnest in their efforts at self-improvement, and in every Evening School one sees earnest faces and strained attention. It is unfortunately no unknown thing for students to come straight from work, where they have been kept too late to be able to go home to tea. This keenness in the pursuit of knowledge is not peculiar to Manchester, though it is there more common than in some other towns; but in Manchester it has been met to an unusual extent by an answering desire to provide the requisite instruction. A wish to spread the benefits of education in the widest sense amongst those least able to obtain them for themselves has long been characteristic of many of the citizens of Manchester. It has found expression in a number of institutions, such as the Mechanics' Institution, the Lower Mosley-street Schools, the Lads' Clubs, and the Recreative Evening Schools."

Sadler has some admirable observations on the question of Compulsory Attendance, and on the very serious hiatus in the type of instruction at which the Primary or Elementary Schools leave the pupil, and the Continuation Schools take the pupil up—an hiatus which amounted in 48 per cent. dropping their instructional course for one and even two years; but these aspects of Technical Education will be adequately dealt with in that part of the monograph which deals with Australia in general and New South Wales in particular.

Evening Continuation Schools in Scotland.

The Scotch are proverbially keen educationists. It is their proud boast to excel in all those branches of human energy which require that mathematical faculty of detailed application which, for want of a better, we term "hard-headedness," and which those of an origin other than Caledonian are apt to consider as synonymous with "hard-heartedness," which, of course, is a sheer misapplication of a hard word to a splendidly commendable mental qualification.

Scotch parents are paternally, and no less maternally, watchful over the educational future of their boys and girls upon leaving school. The result of this fine domestic concern in the career of the advancing generation is admirably exemplified in the capitably equipped Higher Grade Schools of Scotland, in all the large towns of which kingdom Evening Classes are established, with programmes of work as comprehensive and as varied as those in similar departments of the Day Schools. The following document is eloquent as evidence of civic concern for the future educational provision for young students :—

The School Board's Appeal.

"Continuation Schools, Edinburgh School Board, School Board Offices, Castle Terrace, July, 1902. To Parents and Guardians in the City of Edinburgh,—*Evening Schools.*—The School Board of Edinburgh deeply regret that so many of the pupils who leave our Day Schools fail to take advantage of the numerous Evening Classes which are open throughout the City, and often allow years to elapse before enrolling in these classes. Good education is not only in itself a source of happiness, but it is essential to advancement in any trade or profession, and a child's education should not be considered as completed when it is found necessary to remove it from the Day School. The work of our Evening Schools is intended to continue and supplement the instruction in our Day Schools, so as the better to fit the pupils for the intelligent discharge of their every-day duties in after life. Year after year the Head Teachers of our Evening Schools point out the deplorable results of allowing an interval of even one year to elapse before enrolling. Much of what was learned is forgotten, valuable time is spent in revising, and in this way the true work of these classes is greatly hindered. We would, therefore, strongly urge upon you the advisability of sending any of your children who may recently have left the Day School to one or other of the Board's Evening Classes, which open on 22nd September, and of continuing their education there for several sessions. Full particulars regarding these classes will be found in the accompanying prospectus. The Board is anxious in every way to encourage pupils to attend these classes. The Evening Schools meet three times weekly, on Monday, Tuesday, and Thursday. Low fees—repayment of which may be obtained by regular attendance—are charged, valuable prizes are awarded for progress and for perfect attendance, the classes are small so that much individual attention may

be bestowed on pupils, and great freedom is allowed the pupils in selecting those subjects that are most calculated to benefit them in their various occupations.—Flora C. Stevenson, Chairman of School Board, Alexander Mackay, LL.D., Convener of Evening School Committee.”

Such was the appeal on the part of the Edinburgh School Board to parents, to induce them to continue the education of their children at one or other of the Evening Continuation Schools in that City, and in order that every pupil might know the opportunities afforded by this class of School the prospectus was widely distributed. A copy was forwarded to every pupil who had left during the previous quarter; a supply was sent to each Head Master of a Day School for distribution in his district; and the Head Masters and the members of their Staffs were asked to interest themselves in getting their old pupils, who had left school for work, to follow up their studies at the Continuation Schools. In addition to these means of informing the parents and pupils of what the school authorities were doing for them, posters, giving full information of the curriculum and the time-table were placed on the school notice-boards of the Day Schools, and in other parts of the City, and numbers were sent to the large business places to be put inside the premises where they could best be seen by the boys and girls at work. One of the most conspicuous objects in entering a Day School in Edinburgh is the notice at the entrance to the buildings, calling attention to the advantages, to those compelled to leave school at fourteen years of age, of an Evening Continuation course of studies. There can be only the highest commendation for a School Board so fully alive to its trust.

The courses undertaken by the Continuation Schools of Scotland prepare the student either for Commercial or Industrial life-callings; and every inducement, every facility, and every possible encouragement are given to Scottish lads and lasses to secure a good education. The worth of these schools to a community is very great, attendance being continued by those who take the courses up to the age of seventeen or eighteen years. There is no need to examine the curricula at length, however, as there is a marked family resemblance in Continuation Schools throughout the United Kingdom, and any differences between individual institutions are those only which appertain to detail.

In taking leave of the subject of the Evening Continuation Schools of England and Scotland, it is well to consider the great part they play in the educational life of a large section of the people—of the masses as contradistinguished from the classes. It must be remembered that while there is as yet no system of National Education in England, the existence of the Continuation School nevertheless stands to the credit of the British people. In Scotland especially, that land so famous for the strenuous education of its youth, the Continuation School is a great factor for good. The monograph is not here referring to the School which exists for those whose education has been neglected, but to the School instituted for those who, having completed the

primary course in a creditable manner, are ambitious of further educational achievement. In Birmingham, Leeds, Manchester, and other large towns in England, these schools are held in the evening for the instructional benefit of apprentices working during the daytime. The Institutes in question provide for the teaching both of Commercial and Industrial subjects, and it is greatly to the credit of certain engineering and manufacturing firms that they allow boys, apprenticed or otherwise employed by them, to attend certain Technical Schools in the daytime. Prominent among these public-spirited associations are the London and South Western Railway Company (with regard to the apprentices at its Nine Elms Works), the Tees-Side Bridge and Engineering Company, Middlesbrough; Richardson, Westgarth, and Company, Middlesbrough; Bolckow, Vaughan, and Company, Middlesbrough; and Head, Wright, and Company, Stockton; while at Bolton, in Lancashire, three or four hundred apprentices attend evening classes at the expense of their employers, some firms giving ten scholarships, others twenty, and so on, of a value averaging about 25s. each, an amount which covers the fees and the cost of books, instruments, and the general outfit of the student.

Commercial Education in Great Britain.

One of the first Institutions of its kind in the United Kingdom is the Kensington College, Queen's Road, Bayswater, London (W.C.), which has as its ambitious aim the providing for every boy and girl who enters its collegiate course a definite and practical training, followed by an absolute guarantee of a remunerative career as soon as the student shall be qualified to perform the duties thereof, the training being specially adapted for the education of private secretaries, English and foreign correspondents, accountants, book-keepers, and other similar positions of a responsible nature. When the academic side of the training is completed, and all the subjects which comprise the lower rungs of the ladder have been mastered, the students are drafted into the "Model Offices," which are fitted up with all the requisites of a secretarial bureau. Here will be found students who can speak Modern Languages almost as fluently as their Mother-tongue; who can write Shorthand, type their notes accurately, and also perform journalistic duties. They are, in the absence of the Chief, so trained that they can take charge of the office, interview visitors, and conduct the greater part of his correspondence. They are instructed in the conduct of missions of delicacy as ambassadors and the bringing of delicate negotiations to a successful issue, the writing of an essay or a lecture, the preparation of statistics, and the making of searching literary investigations.

The Solicitor-General of the United Kingdom, Sir Samuel Evans, speaking from the chair at the recent twenty-first anniversary of Kensington College, said:—

"The history of the College is the history of a progressive Institution, which is really required in our educational system. Constantly men in our public life have brought to their attention young people, some from the schools,

some from the Colleges (yes, indeed, some from the Universities), who have attained their degrees or achieved success in their colleges and schools, and *who yet do not know how to perform the actual work of life. The part of the educational system of this country which is deficient in many respects from the public point of view* appears to me to be admirably done by this College. The College is certainly, as I think, filling a most excellent place in our educational system."

Sir Albert Rollit (the Chairman of the Education Committee of the London Chamber of Commerce), stated that, in his opinion, "the College had solved one of the greatest, the most complex, and the most difficult of all educational problems—that of securing employment after education"; while the Duchess of Marlborough declared that,—

"It is this practical aspect that especially appeals to me, for we all know that many young men and young women who have received the highest education are unable, from want of knowledge of technical and secretarial work, to obtain posts worthy of their acceptance. Now, the education which they receive at Kensington College does away with this difficulty, and completes their training, making it efficient and business-like. Then they are not only fitted to fill posts, but they are also guaranteed a good position to start with."

The Director of the College was able to assure the meeting that there was not a single qualified student of the Institution seeking an appointment, and during the past year the applications for the services of the College graduates had exceeded the number of students available. The College had, moreover, succeeded in capturing the blue ribbon of the London Chamber of Commerce for proficiency in Modern Languages, and had obtained a long list of successes at the various examinations.

The motto adopted by Kensington College is, by the way, worthy of record. It is one suggested by the Right Hon. the Earl of Lytton, when speaking from the chair at a recent distribution of prizes. Having in mind Dante's dread warning over the gates of the Inferno, he thought it would be appropriate to inscribe over the portals of Kensington College the following variation thereof:—"Have every hope, all ye who enter here."

The Kensington College is, of course, a highly specialised Institution, conducted under the ægis of the highest-placed Members of the British Government, for the technical training of Parliamentary officials, ambassadorial attaches. Its principle is, however, the same as that of the German Trade School; namely, if a specialised worker is wanted, he must be the outcome of a specialised training—and this is a necessary modern requirement which the University, conducted on Mediæval lines, is powerless to meet. The ordinary Commercial School is something very different from the Kensington College, as the demands made on its training are necessarily of a humbler character.

The subject of Commercial Education is one of very great importance, and its place in the school curriculum is one of widespread interest among educationists. In

the year 1899, a special Sub-Committee appointed by the Technical Education Board of the London County Council, to consider and report upon the special agencies which existed within the City of London for imparting Commercial Education, and to suggest plans for establishing other agencies and increasing the efficiency of those already in existence, presented its report after a most exhaustive inquiry into Continental methods of Commercial Education, together with a large number of interviews with representative business men.

In the first place, the Committee referred to the unanimous decision of the Antwerp Congress, in 1898, against specialisation on Commercial subjects in Primary Schools, and considered that whatever branch of Commercial life a boy intended to enter, it was necessary he should receive as good a General Education as was possible in the Elementary School; but the Committee emphasised also the importance of bringing the teaching of the Elementary School more into relation with actual every-day life, and making the instruction practical in its application. Moreover, great stress was laid upon the necessity for the universal teaching in Elementary schools of the decimal system in its application to all branches of Arithmetic, especially money, and of the Metric System in its relation to weights and measures, and attention was directed to the importance of the teaching of Mental Arithmetic in the ordinary business affairs of home life. The Committee favoured the organisation of Higher Grade Departments in connection with Elementary Schools, which, while continuing the General Education, would give a more specialised training to boys entering business houses at the age of about 14 years. On the question of teaching Shorthand and Type-writing in the Higher Grade Schools (subjects which Professor Layton, of the Higher Commercial School of Antwerp, in giving evidence before the Committee, stated that he regarded rather as "useful accomplishments" than as "educational specialisation") the Committee saw in these subjects a considerable amount of training value, and decided to recommend them in the Higher Grade Curriculum so long as their study was not detrimental to the more general education which was carried on at the same time. It is unnecessary to survey the whole of the Committee's recommendations, as the majority of them were adopted, with more or less modification, and may be studied in their actual working in connection with the specialised Commercial Schools, which have a general resemblance to some similarly conducted schools on the Continent of Europe.

The Schools which afford the best illustration of Elementary Commercial Education systematically given are the Upper Primary Schools of France, and the Higher Grade Schools of England and Scotland. One of the specialised branches of instruction in the French Schools is the teaching of Commercial subjects, and the object of the instruction is to give the pupils a bias towards a business life. The course in the Higher Grade Schools is arranged to suit the requirements of both boys and girls who are preparing for entrance upon a business career, and

special attention is given to such subjects as English, French, German, Commercial Arithmetic, Commercial Geography, Book-keeping, Shorthand, and Typewriting. Pupils enter the special classes of the Higher Grade Schools, as a rule, at about the age of 13 years, and the course extends over three years. On its completion, many of the pupils present themselves for Junior Commercial Certificates issued by the London Chamber of Commerce, and similar Commercial Institutions. The splendid system of Evening Continuation Schools (already noticed in a preceding section of this monograph) affords excellent opportunities for a commercial training to those children who cannot remain at the Day Schools to take advantage of the specialised course. The Evening Classes in Leeds and in Manchester, for instance, give special encouragement to pupils taking up the Commercial Courses. The Manchester School Board provides for the teaching of Modern Languages (French and German; and, incidentally, Spanish) in all its Evening Continuation Schools, and offers in its Special Commercial Classes for Men and Women a range of Commercial subjects of a very high standard. The Leeds School Board does not give so much prominence to modern languages in its Evening Classes, French only being taught; but it offers a supplementary free course of Manual Training.

The pupils of the Higher Grade Board Schools and the Evening Commercial Continuation Schools are among the regular candidates for the Junior Certificates given by the London Chamber of Commerce at its yearly examinations. The scheme of the last-named Institution adopted for the Junior Commercial Course embraces English and Writing, History, French or German, Geography, Mathematics, Elementary Science, and Drawing. The sub-divisions of these general heads include Spelling and Dictation, Reading (recognised English Classics are used, and not mere Reading Books), Recitation, Knowledge of the Parts of Speech, Simple Composition and Writing, the History of England; the pronunciation (of either French or German), the acquisition of Words and Phrases, Dictation, Elementary Grammar, Reading and Translation into English, and the Recitation of passages learned by heart; Elementary Facts of General Geography, and the Elements of the Geography of the British Isles; Arithmetic (including the Elements of Vulgar Fractions and Decimals), Mental Arithmetic and Rapid Calculation, Simple Geometry, and the Employment of Rule, Square, Compasses, etc.; Lectures on Elementary Physiography and Drawing. This is the curriculum of the first year.

During the second year the Arithmetic Course includes Long Tots, Cross Tots, Decimal Calculation, Square Root, Proportion, Practice, Simple Interest, and Simple Constructive Geometry; the English Course, Exercises upon Grammar and Etymology; and in the Writing Section, the use (as copies) of Bills, Letters, Circulars, &c., both in English and in French or German; the Geography Course, the General Geography of Europe, Configuration, Climates, &c., the principal seas, mountains, rivers, &c., the European States, with their chief characteristics, Physical and Political Geography,

principal towns, population, military forces, &c., and Elementary Economic Geography, with special reference to agriculture, mines, industries, and chief modes of communication; the Elementary Science Course, Physics or Natural History, or both, making optional or alternative Physics, and Botany (*i.e.*, Essential parts of a Plant, Methods of Nutrition, general characters of different groups of Plants as exemplified by certain types)—the pupils themselves dissecting and describing plants; the Drawing Course, Freehand Drawing, Outline and Shading of Geometrical Figures and Geometrical Drawing (with the use of scales) of Simple Designs, and the use of Indian Ink; the other subjects not otherwise referred to being continued under the specified time-table of the first year.

The third year is a steady advance upon the second. English now includes the Analysis of Sentences, and the rules essential in Composition, especially in the form of the reproduction of the stories read. In the French and German languages Conversational Exercises are included. The History of England is studied in connection with Literary and Contemporaneous General History. General Geography becomes Physical and Economic, of the British Isles and the Possessions of the British Empire, with the main routes of traffic and ocean highways. Mathematics embraces Arithmetic (Proportion, Practice, Interest, Discount, Stocks, &c.); Algebra (the Elementary Rules and Simple Equations); Geometry (the First Book of Euclid, as far as the twentieth proposition); and (optional or alternative) Physics and Chemistry. Natural History is extended to the Elements of Zoology; and Drawing takes in Shading from Simple Objects, from Cubes and Spheres, from Bas-reliefs of Leaves, Ornamental Flowers, &c., from Architectural Fragments, Elements of Perspective or Geometrical Drawing, Projection of Simple Solid Objects, and Elementary Architectural Drawing.

During the fourth year the English course is advanced to Literature, Language, Composition, Writing in English and German characters, and Shorthand. French or German now includes Dictation, the Composition of Simple Letters and the Writing of Essays, together with Reading and Translation; and the modern languages embrace, besides French and German, any of the alternative tongues, Spanish, Portuguese, or Italian; while Latin is made an optional subject. A brief course of Ancient History is given, with special reference to the Colonies and Commerce, and a revision of English History. Geography deals with the Commercial Geography of the British Isles, including Agriculture; Animal Produce; Mineral, Textile, and Chemical Industries; Commerce; Railways; Steamboat Service; Colonisation; and the Physical Geography of Africa, Asia, America, and Oceania. Mathematics now takes in Exchanges and the Metric System (in Arithmetic); Factors and Fractions, Greatest Common Measure and Least Common Measure, Quadratics, Logarithms, and the Elements of Logarithmic Calculation (in Algebra); and the whole of the First Book of Euclid (in Geometry). Natural History comprises the Elementary Facts of Physiology. Book-keeping becomes a specialised subject, together with the Theory of Accounts, Balancing,

Profit and Loss, International Exchanges, Moneys, &c. Drawing takes in Freehand Drawing from simple casts, the Human Figure from Bas-reliefs, Elementary Anatomy or Geometrical Drawing, Architectural Studies, Mechanical Drawing, Machines, &c.

The fifth year extends the scope of the Modern Languages Course to the Formation and Composition of Words, Literature, Conversation, and Correspondence. The Commercial History of the Middle Ages and Modern Times, together with Geographical Discoveries is listed as the History Course. Geography now deals with European Commercial Geography, including Agriculture, Industries and Commerce. Mathematics extends its province to Trigonometry, with its definitions, measurements of angles, and simple applications; advances in Geometry from the First to the Fourth Books of Euclid, taking in Mensuration; and specifies a course in Mechanics, in the Principles of Energy, the Mechanical Powers, the work done by Machines, and Hydrostatics. Natural History for the fifth year sets down General Anatomy and Physiology (human and comparative), Digestion, Absorption, Circulation, Respiration, Innervation, and Locomotion. Instead of the Natural History Course, the pupil may, however, take up Geology. Drawing advances to the Introductory History of Art.

In the sixth year, the Modern Languages Course deals with Syntax, Idioms, Literature, Composition of Commercial Letters, &c. In the Historical Course, Contemporaneous Commercial History is the selected subject. Geography engages in its sixth year programme the Commercial Geography of Africa, Asia, Oceania, America; Animal and Vegetable produce; Mines, Metals, and Precious Stones; and Industries, Markets, Ports, and means of Transit. Commerce and Commercial Law now intrude, with subdivisions specified as Commerce, Commercial Contracts, Insolvency and Bankruptcy, Commercial Law, Industrial Law, Chambers of Commerce, Patents, &c. In Mathematics, the sixth year regime lists Binomial Theorems, and higher work in Algebra; Books I, IV, and XI (the last-named optional), and Mensuration, in Geometry; Kinematics, Kinetics, Dynamics, in Mechanics; and the Cosmography of the Earth, Sun, Moon, Planets, Comets, &c. Political Economy now makes its appearance, with particular insistence on the Aim thereof—the Production of Riches, the Distribution of Riches, Exchanges, Money, Credit, Saving, Luxury, and Application to Financial Legislation. In the Drawing Course, extended attention is devoted to Composition, Geometrical Drawing, Designing, and the History of Art; or (as an alternative course) Photography, Photogravure, Engraving, Etching, Painting, Sculpture, &c.; but in either case, the History of Art.

The first year's course is arranged for students of the London Chamber of Commerce (Junior Curriculum) from about the age of ten years to that of twelve; the second year's, from eleven to thirteen; the third, from twelve to fourteen; the fourth, from thirteen to fifteen; the fifth, from fourteen to sixteen; and the sixth, from fifteen to seventeen years of age.

The entire course of the London Chamber of Commerce "Junior Commercial" for the six years embraced in this exploitation, has been herewith given ; for it is not only good in itself, but it supplies a very fine model of an ideal curriculum aiming at a specialised Commercial Education and co-ordinated with a scheme of General Culture which directly ministers to, illustrates, and tenders aid to a distinctive life-calling, more than any other, depending continuously on extensive auxiliary assistance.

M. E. Sadler, in his exhaustive work, "Continuation Schools in England and Elsewhere," remarks that :—

"The Commercial Schools have usually grown out of the Higher Grade Continuation Schools. Where two buildings are available, the Continuation School and the Commercial School are sometimes kept distinct ; otherwise they are merged, the Commercial School becoming constantly more important, the Continuation School less important. Hereafter they will probably become quite distinct, the Higher Grade Schools forming junior schools linked with Central Commercial Schools. They are usually held in the buildings of Elementary Day Schools, and the Head Master (or responsible teacher) is generally a teacher in an Elementary School. But in many cases they have developed into important colleges with 1,000 or 1,500 students, demanding the same direction and control as the Polytechnics and Schools of Art. Offord Road School, Barnsbury, the Oliver Goldsmith School, Camberwell, and Queen's Road School, Dalston, are three examples of Schools which, starting as simple Evening Classes, grew into great Colleges, with highly-qualified teachers, and a curriculum covering the ordinary needs of those engaged in Banks, in the Civil Service, or in Higher Commerce."

Technical Education in the United Kingdom.

Next in academic dignity to the University stands such an Institution (for example) as the "Royal College of Science," of South Kensington, and the Polytechnics and Higher Colleges. The "Technical Institutes" and "Arts and Crafts" Schools, and institutes for instruction in special industries and trades constitute the lower plane of effort in Technical Education, though beneath these again may be ranked the Manual Training Schools, and lastly the Kindergartens.

The value of the Kindergarten, and of the Manual Training in the Elementary School, namely, either Sloyd, or some form of exercises in Carpentry, or Wood or Metal Work, is becoming better recognised in the United Kingdom. At the present time there is, however, no adequate attempt thoroughly to organise this type of instruction. All that can be said is that *Educationists* recognise its value to the fullest degree, and large numbers of schools are being equipped in material and personnel for such teaching. The Kindergarten is admitted to be an excellent preparation for the severer and more advanced exercises which are to be found in Sloyd, or in other systems of Manual Training.

The work done under the supervision of the Technical Education Board of the London County Council may be referred to as being the most comprehensive attempt throughout the British Empire, to deal with the need for specialised instruction. There are under the care of this organisation the institutions aided or conducted by the London County Council, to wit—(1) the University of London; Bedford College, London; King's College, London; the London School of Economic and Political Science; and University College, London; (2) the Battersea Polytechnic Institute; the Borough Polytechnic Institute; the City Polytechnic, comprising the Birkbeck College, the City of London College, and the Northampton Institute; the Northern Polytechnic Institute; the Regent-street Polytechnic Institute; the South-Western Polytechnic Institute; and the Woolwich Polytechnic Institute; (but the East London Technical College—*i.e.*, the People's Palace—and the Goldsmiths' Institute, New Cross, are not aided by the Council); (3) the Camberwell School of Arts and Crafts; the London County Council Camden School of Arts; the London County Council Central School of Arts and Crafts; the London County Council Clapham School of Art; the London County Council Hammersmith School of Art; the London County Council Paddington Technical Institute; the London County Council Popular Technical Institute; the London County Council School of Building; the London County Council School of Carriage-building; the London County Council School of Photo-engraving and Lithography; the London County Council Shoreditch Technical Institute; the London County Council Sydenham Technical Institute; the London County Council Westminster Technical Institute; and the London Day Training College; (4) the Aldenham Institute, St. Pancras; the Church Institute, Upper Tooting; the Craft School, Mile End; the Devas Institute, Battersea; the Hackney Institutes (Cassland House and Central Branch); Herold's Institute (a branch of the Borough Polytechnic Institute); the Norwood Technical Institute (a branch of the Borough Polytechnic Institute); the Royal School of Art Needlework; the St. Bride Foundation Institute; the School of Art Wood-carving, South Kensington; and the Wandsworth Technical Institute; and (5) the Blackheath, Lee, and Lewisham School of Art; the Clapton and Stamford Hill School of Art; the Lambeth School of Art; the Putney School of Art; the Royal Female School of Art; and the St. Martin's School of Art.

In considering the provision for Art Education in London, it should be borne in mind that every Polytechnic, except the Northern Polytechnic, possesses an *Art Department* which is said to be entitled to rank as a *School of Art*, and in some cases as a *School of Arts and Crafts*.

Besides the five classes of institutions enumerated above, there are certain Evening Classes in Science, Art, and Technology, which of themselves do not constitute organised schools, under the conduct of the London County Council, such as the Evening Science and Art Classes at Bell Lane East (the Jews' Free School); the Science and Art Classes at the Morley Memorial College; the Evening Science Classes

at the William Ellis Endowed School ; and the Science and Art Classes at the Working Men's College. The Council also aids a *School of Practical Gardening* conducted by the Royal Botanic Society, besides a very great number of Secondary Schools and Schools and Classes of Domestic Economy, including the Sailors' School of Cookery for the training of Ships' cooks, conducted by the Council at the Sailors' Home, Dock Street. These provisions for Technical Education disclose the nature and extent of the arrangements made for specialised instruction in and near the metropolis of Great Britain. The annual expenditure is now probably about half a million sterling.

Among the subjects taught in the various Institutions controlled or aided by the London County Council's Board of Technical Education may be enumerated the following :—Baking, Bookbinding, Boot and Shoe Manufacture, Brass-finishing, Brickwork and Brick-cutting, Cabinet-making, Candle-making, Carpentry and Joinery, Carriage-building, Carving and Gilding (Picture-framers), Chair-making, Chasing and Embossing, Collotype, Colour-making, Cycle and Motor Making, Diamond Mounting, *Electrical Engineering*, Electrical Instrument Making, Electric Wiring and Fitting, Electro-Metallurgy, Electro-plating, Electrotyping and Stereotyping, Enamelling, Engraving, French-polishing, Furniture Design, Furniture Enamelling, Furriers' Work, Goldsmiths' Work, Hair-dressing, Instrument Making, Iron and Steel Manufacture, Jewellers' Work, Leather Dyeing, Lithography, Masonry, *Mechanical Engineering*, Metal-plate Work, Milling, Optical Instrument Making, Opticians' Work, Painters' and Decorators' Work, Paper Manufacture, Photo-process Work, Plasterers' Work, Plumbing, Press-tool Making, Silversmiths' Work, Smithing, Soap Manufacture, Stained-glass Work, Staircasing and Handrailing, Stone-carving, Tailors' Cutting, Tanning, Typography and Letterpress Printing, Upholstery, Varnish Making, Watch and Clock Making, Wheelwrights' Work, Wood-carving, Woodcuts in Colour, Wood-engraving, and Zinc-work. Two subjects in the above list are italicised. They are *Electrical and Mechanical Engineering*, and their significance in modern industrial life is emphasised by their rapid development as branches of Technical Education, and by the great number of students who have taken up these courses.

Technical Instructional Courses in the Higher Grades are given at such modern Universities as those of Birmingham, Liverpool, the Victoria (Manchester), the Yorkshire (Leeds), the Durham (Newcastle-upon-Tyne), King's (London), the Royal University of Ireland, the University College of Wales (Aberystwyth), the University College of North Wales (Bangor), the University College of South Wales and Monmouthshire (Cardiff) and Edinburgh ; and the Heriot-Watt College (Edinburgh) the Manchester School of Technology, the Finsbury City and Guilds Technical College, the City and Guilds of London Institute, the East London Technical College, and a number of Polytechnic Institutes.

Concluding Remarks on Technical Education in Great Britain.

Everywhere in Great Britain is ample evidence of the growing spirit of proper appreciation with regard to the value and imperative national necessity of cultivating a healthy taste for Technical and Specialised Education, as the co-ordinated mental outcome of Primary, Elementary General Instruction, which has its usual termination with the youth of both sexes at the age of 14 years.

Everywhere in England and Scotland (and especially in London and Manchester) Educationists are putting forth vast efforts to fill this clamant necessity, upon the satisfaction of which, more than upon any other social and economic need, the future welfare, and even the present continuation, of the Empire rests. While there is, as yet, no such concrete realisation of a loftily limned ideal as a National System of Education throughout Great Britain, credit is undoubtedly due to both England and Scotland for the efforts made by these sister kingdoms to carry forward the education of the young, from its terminal departure at the Primary School, by means of Evening Classes and Continuation Schools. Scotland has always been noted for its ardour in the education of its youth; and in the northern half of Great Britain the Continuation School, considered in this connection, can be regarded as a factor in national welfare working only towards a high and noble ideal. This monograph does not here refer to the School which has been called into existence for those whose primary education has been woefully neglected, but to the School for those particularly who, having efficiently completed the Primary Course, are desirous of advancing educationally along the path of a further progress. As the foregoing pages must have shown the attentive reader, the great population centres of Birmingham, Leeds, Manchester, and other large, wealthy, progressive, and populous towns in England, possess such Continuation Schools—instructional seminaries of the highest national importance, where classes in General and Technical Education are held in the evenings, for the benefit of apprentices (and adult workmen) engaged in workshops and offices during the daytime, and where courses are given both in Commercial and Industrial subjects.

Technical Education in other European Countries.

This monograph has dealt at some considerable length with the subject of Technical Education in Germany, Switzerland, the United States of America, Canada, and Great Britain, and little now remains to be said of those other progressive countries of Europe where Specialised Instruction has engaged the attention of Educationists, at the head of which probably stands France; but, for the sake of completeness, a passing reference will be here made to them before coming nearer home, glimpsing that rising young nation whose symbol is the blood-red chrysanthemum *en route* to the Land of the Southern Cross.

Although the various schools of Paris do not exhaustively represent the provision made in France for the education of the French people, they stand much in the same

relation to the educational provisions of the rest of France as do the schools of Berlin and its suburbs to those in other parts of Germany. Notwithstanding the brilliancy of French achievement in Higher Education, and in the development of Higher Knowledge, together with the early organisation of its Educational System and, moreover, notwithstanding the splendid contributions that France has made to Applied Science, especially in Agriculture, Technical Education has been adequately advanced only quite lately, namely (and the fact is true, also, when applied to her great Teutonic antagonist) since the Franco-German War; and it is openly recognised by French Educationists that the greatness of the misfortunes which crushed France to the earth was the stimulus to effort—her troubles drove her imperatively to improve her methods of Commercial and Industrial Education. For instance, during the Liberal Ministry of Drury (1868) an opinion gathered force with the passing of the hours that the old system of apprenticeship must, *in the interests of national efficiency*, be replaced by systematic instruction. In 1872, the idea was concreted by the disasters of the war, and M. Gréard, the Director of Education, submitted a memorandum suggesting the opening of a School for Instruction in the Wood and Iron Industries. Even to those least prepared to accept the new idea, the advocacy of Gréard carried conviction. He demonstrated the *national advantage* of replacing the method of learning through apprenticeship by that of learning through such systematic instruction as could be imparted only in a properly-developed school. He showed that the existing means for preparing young people, on leaving the Primary School, for their life-callings was insufficient; that in the apprenticeship system, egoism operated in various ways strongly against the national interest; that the master of apprentices was compelled to sacrifice the welfare of his apprentice more or less to the exigencies of his business; that workmen, reacting to a narrow selfishness, and often incapable of perceiving the issue from the standpoint of national development, were hostile to apprentices, and were by no means friendly to their entry into the ranks of workmen; in fact, the old system of apprenticeship was subject to many defects, and, as a method of professional education, was intermittent, without order, and opposed to the interests of the people, considered as a whole. Gréard conquered, and his triumph resulted in the establishment in France of the celebrated *Ecoles Manuelles d'Apprentissage*.

In that other so-called Latin nation, Italy, Technical Education comes under the control of two Ministerial authorities—namely, the Ministry of Agriculture, Industry, and Commerce, which is charged with the supervision of the Commercial, Industrial, Trade, and Industrial Drawing Schools, and the Schools of Applied Art; and the Ministry of Public Instruction, which is charged with the supervision of Technical Schools and Institutes. The Royal Higher Naval School of Genoa, the Royal Industrial Museum of Turin, a number of Royal Higher Schools of Commerce, Elementary Commercial Schools, a large number of Industrial Schools of Arts and Crafts, several Higher Schools of Art Industries, a large number of Elementary Art

Industrial Schools and Industrial Drawing Schools, a number of Commercial and Industrial Schools for Women, &c., are administered by the Political Chief of the Department of Agriculture, Industry, and Commerce. The Museum is a State Institution ; but other institutions are subsidised by the State, supported by local authorities, the Province or Commune, by Chambers of Commerce, by Workmen's Associations, &c.

Belgium, neither absolutely Latin, Scandinavian, nor Teutonic, but a northern temperate-zone race which combines something of the characteristics of these three distinct Aryan strains, has adopted a very specialised system of instruction. The aim of the *Ecoles Professionnelles* differs, for instance, very greatly from that of the Industrial School. Thus, while it does not neglect to inculcate the importance of the *theoretical* knowledge which is essential to the best exercise of his calling, it keeps the *practical* education of the pupil in his calling primarily in view. The aim of such schools may therefore be said to be (1) to afford a practical education to various occupations ; (2) to make young people and workmen familiar with the most recent, perfect, and advantageous processes in their callings ; (3) to raise the economical level and material condition of workmen ; and (4) to enable workmen to pass readily from one calling to another, which is often necessary, owing to great industrial transformations.

Holland, the near neighbour and one-time historic partner of Belgium, has quite a different meaning for the term "industrial" from that applied to the word in English-speaking countries. The Industrial School for Girls, at the Hague, for instance, has for its aim the training of girls, between the ages of thirteen and eighteen years, in usefulness in the home, or as servants and shop-girls, and the giving of them practical instruction in such branches as will fit them for the duties of housewives. Millinery, Dressmaking, Embroidery, Ironing, ordinary Book-keeping, Knitting, Darning, and renovating and repairing old but valuable carpets are among the subjects taught. There is also a House-keeping School at the Hague for young ladies, with a view of preparing them to become efficient household managers. In this city there is besides a Crafts and Professional School for boys between the ages of thirteen and sixteen years, in which are taught House-painting and Decorating, Furniture-making, Clay-modelling, Carpentering, Blacksmith's Work, and the work of Machine Shops. This School is maintained conjointly by the Province, the City, and the Government.

Norway has a State institution in Kristiania in which much of the instruction is free, and where a charge is made it is a very light fee. Drawing, Designing, and Modelling are the chief subjects taught on the theoretical side, and these are practically applied to the Building and Finishing Trades. The Industrial Art School does not profess to be an Art School of the Higher Grade, but is intended to benefit those students who are artistic in their tastes, and who desire to excel in the trades which they have selected. In the Institution referred to, the students are sent out into the city to take measurements of a building, and when they return are required to draw the building to a plan, show elevations and sections, prepare specifications, and make all

the necessary preparations prior to handing the building over to the constructive tradesmen, who, in their turn, deal with the structure in their class-rooms. The cabinet-maker is engaged in making suitable furniture, the upholsterer is employed on his finest work, and the art decorator is occupied with some beautiful nature-designs in tapestries and panels, showing a harmonious blending of colours, and affording scope for displaying taste.

At Göteborg, Sweden has a Sloyd School which is attended by girls from 15 to 18 years of age, and in which Drawing, Modelling, and Wood-carving are taught. The attached Museum contains choice specimens in glassware, porcelain goods, inlaid furniture, rich carvings, and beautiful models; and the effect of these specimens, &c., upon the work of the pupils is clearly to be seen. The object of the Lower Technical Schools in Sweden is the preparation of the student for industrial callings, and the affording of theoretical and practical knowledge of a technical character. The oldest, at Malmö, dates from 1853, and there exist three others, respectively at Norrköping, Örebro, and Borasat, at which last-named town is a Weaving School. Sweden possesses also Technical Schools at Eskilstuna and Stockholm, and has made ample provision for instruction in various life-callings, such as Mechanics, Millers, Boiler-makers, Ship-builders, Bridge-builders, Ironfounders, Electro-Technical workers, &c. Educational Sloyd is a great feature in all Swedish instructional schools.

Technical Education is not very advanced in Finland, nevertheless a sound beginning has been made by the manual training (Sloyd) in the Elementary Schools. The Finnish Polytechnic had its origin in a Technical School founded in 1849. It is an Institute of University Grade, with four years' Courses in Architecture, Civil Engineering, Mechanical Engineering, Chemical Technology, and Land Surveying.

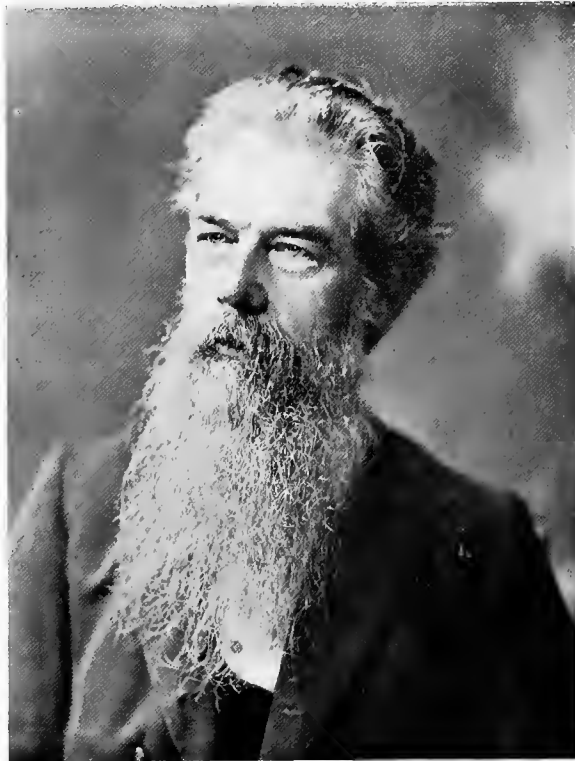
In St. Petersburg, the capital of Russia, a vigorous effort is made to educate the artisan both generally and practically; and no one could fail to realise the immense advantage which students so trained have over those educated by apprenticeship to the ordinary tradesman. The Tsessarevitch Nicolas Lower School for the training of boys as artisans is the oldest and largest of six similar institutions in the city of St. Petersburg. Pupils are admitted between the ages of 12 and 15 years, on the conclusion of the four years' Primary Course. The work is divided into two large sections, namely, Mechanical Engineering and Working in Wood, to which lately have been added Classes in Watchmaking and Optical Mechanics.

There is no country, no matter how backward in the scale of national progress, which has not awakened to the necessity of Specialised Instruction in some form or other, be that country decadent European Portugal, or newly-born Asiatic Japan, in which it may be regarded as absolutely in its infancy. These Japanese Schools are classed as Apprentice Schools, for children of 12 years of age and upwards, and Industrial-Technical Schools, with a course, nominally, of three years, which may, however, be prolonged to four.

II--Twenty-five Years Technical Education in New South Wales.

FOR the following information respecting Technical Education in the past in New South Wales, the writer is indebted to G. Hooper, Esq., Assistant Superintendent, and Norman Selfe, Esq., Member of Inst. C.E. Both gentlemen have been closely associated with Technical Education in this State for many years, Mr. Selfe as Chairman of the late Board of Technical Education, and Mr. Hooper as Registrar of the Sydney Technical College, and both are thoroughly conversant with the subject:—

Some forty-four years have elapsed since the work of Technical Education began in Sydney, and its inception can be traced to those who formed the Committee of the Mechanics' School of Arts as far back as 1865. The first class for Mechanical Drawing was conducted by Mr. Norman Selfe (afterwards a member of the Board of Technical Education and Acting President of the same). In 1869 Mineralogy and Geology classes were started, and in the following year a School of Design. No additional subjects were added until 1871, when Chemistry classes were formed. The work steadily progressed for six years, during which time the attendance and popularity of the classes warranted a movement to found a Working Men's College. This proposal emanated from Mr. E. Dowling in 1873, who afterwards became Secretary to the Board of Technical Education. The Committee of the Sydney Mechanics' School of Arts was favourably impressed with this idea, and secured additional land at the rear of the School of Arts building for purposes of providing class-rooms for imparting technical instruction. For three years several Committees of the School of Arts deliberated upon the necessity for increased class accommodation, but no definite steps were taken until 1878, when Parliament granted £2,000 towards the inauguration of a Technical College.



NORMAN SELFÉ, M.I.C.E.,

Teacher of the first Mechanical Drawing Class in 1865, and Chairman of the late Board of Technical Education.

Among the very first instructors appointed was Mr. W. A. Dixon, F.C.S., F.I.C., who had charge of the Department of Chemistry.

The first Instructor in Art under the School of Arts *regime* was the late Mr. Phillips, a talented South Kensington student. Mr. Phillips was followed by that extraordinary genius, the late M. Lucien Henri. This gentleman was, from his first appointment, a strong advocate for teaching drawing from the round, as opposed to drawing from the flat, which had then many supporters. The Committee endorsed the view of the Instructor, and imported a valuable series of casts for the drawing classes. Subsequently the Committee was enabled to supply copies of many of these casts to the High and Superior Schools under the Department of Public Instruction, to educational establishments in the adjoining Colonies, and at cost price to many private schools in New South Wales.



THE RIGHT HON. G. H. REID, P.C.

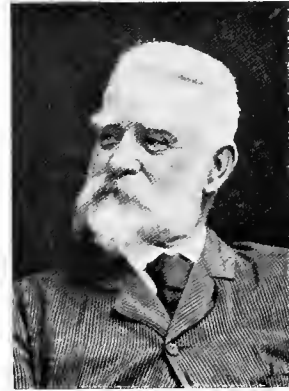
During the previous year the members of the School of Arts authorised the expenditure of £5,000 to provide further accommodation. The number of students largely increased, and other subjects were added to meet the demand. For five years the Technical College worked on, notwithstanding the limited funds at its disposal. In 1879 a Technological Conference was held under the Presidency of the late Sir Henry Parkes, when Mr. Justice Windeyer, Mr. Norman Selje, Mr. John Sutherland, and others addressed the meetings. (The last three named gentlemen were appointed members of the Technical Education Board.) Several important matters were discussed, among which was the necessity for the Government to bring forward a bill dealing with Technical Education. The work of the College assumed larger proportions, and its usefulness was recognised by the Stuart Government through the Hon. G. H. Reid, who was then Minister for Public Instruction.

In 1883 the management of the Technical College was transferred from the Committee of the School of Arts to a Board appointed by the Government. This Board consisted of 19 members, among whom were Mr. E. Combes, President; Mr. E. Dowling, Secretary; and Mr. Owen Blacket, now Lecturer in Charge of the Department of Mechanical Engineering.

Technical Education now received unremitting attention, and the Board furnished recommendations to the Minister of Public Instruction regarding Elementary Science and Art teaching in Primary Schools, and its continuation in Technical Schools.

The class-rooms at the School of Arts were soon found to be inadequate, and a large building in Sussex-street (known afterwards as the Technical Institute) was rented by the Board. Rooms were also engaged in the Royal Arcade for Cookery classes as well as class-rooms at the Public School in Castlereagh-street for teaching Commercial Subjects.

The work of Technical Education was not confined to the metropolis, for meanwhile itinerant lecturers had been engaged to visit the country towns, deliver lectures, and obtain names of intending students. Wherever sufficient support was given classes were formed, and this resulted in the establishment of branch Technical Schools at Bathurst, Goulburn, and Newcastle. At each of these centres a resident master was appointed, who devoted himself entirely to the formation and conduct of either Science, Art, or Commercial Classes. Outlying districts were also considered, and classes inaugurated there.



OWEN BLACKET,
Member of the old Board of Technical
Education, now Lecturer in
charge of the Department of
Mechanical Engineering.

Technical Education was becoming known among the artisans, and numerous applications were received for instruction in trade subjects. Carpentry, Masonry, and Bricklaying classes were started, and others connected with Engineering. On the 11th December, 1884, the Board requested the Government to commission the President to visit and inquire into the Technical Institutions in Great Britain and the Continent. When Mr. Combes returned, he presented a very able report to His Excellency the Governor, which was printed by order of Parliament, and circulated throughout the colonies.

In 1884 students' works were forwarded to the National Competition of the Science and Art Department of Great Britain, which secured one bronze medal and six prizes. For several succeeding years the awards were equally meritorious.

The heads of the various departments of the College were in the same year asked to consult together and submit a curriculum. The outcome of their recommendations was the publication of the first Calendar for the year 1885. On the 4th May of that year, the Minister of Public Instruction intimated that he was of opinion that a site for the erection of a Technical College should be procured. The Board, acting on this intimation, and after careful inquiry and consideration, suggested the purchase of an area of land adjoining Ultimo House, the property of the late Mr. John Harris, of Shane's Park. In the following June, the late Dr. Renwick received a deputation from the Board urging the purchase of the site. The Minister promised to submit the matter to the Cabinet at the earliest opportunity, but the land was not secured until October, 1889.

In September, 1885, the Committee of the City and Guilds of London Institute was asked to extend its system of Technological Examinations to this Colony, and the first examinations were held in 1887.

On 30th June, 1886, at the request of the late Hon. Arthur Renwick, M.D., a draft bill was submitted to him to incorporate the Board of Technical Education, as the omission to define its powers had militated against its administration and work.

The annual grants voted by Parliament enabled the Board to expand each year, and from time to time special sums were set apart for the purchase of apparatus. Gradually the classes were being equipped, and whenever opportunities offered, models of machinery and appliances of the best make were secured. The need of a technical library was felt, and a number of books was bought which formed the nucleus of the present library.

The Board did not confine itself to theoretical instruction, for whenever possible, practical work was insisted upon. On the 6th September, 1886, His Excellency, Lord Carrington, opened the workshops, which were situated in Kent-street, immediately at the rear of the Technical Institute. The late Mr. H. C. Russell, B.A., F.R.S., the Acting President, delivered an interesting address. Amongst those present were the Minister of Public Instruction and the Under Secretary, members of Parliament, representatives of the various trade societies, &c. The workshops were fitted with such machinery as would supplement the theoretical instruction imparted to students in the mechanical classes. The rents paid for buildings now amounted to £3,000, and the individual students attending the Sydney Technical College exceeded 1,000.

The large hall in the Mechanics' School of Arts was engaged four evenings each week for the delivery of popular lectures on Science and Art subjects. No charge was made for admission, for these lectures were intended for working men, and to induce students to join the classes.

An Instructor in Agriculture was appointed, who, in addition to carrying on classes at the Technical College, also visited country districts and delivered lectures. These lectures were well attended by those following agricultural avocations. On 11th June, 1886, a deputation waited on the Colonial Secretary to request that a sufficient area of ground adjoining the Boys' Reformatory at Bankstown be set apart for an Agricultural and Veterinary School. In the same year Mr. A. Kethel, a member of the Board, carried a motion in Parliament for the establishment of Agricultural Colleges. The Instructor in Geology arranged lecturing tours in the mining districts. After the lectures the miners were assisted by giving them useful and simple methods for testing minerals.

At the request of the Minister of Public Instruction, the Board collected a number of works executed by the students in the Sydney Technical College and branch schools to illustrate their courses of study, and forwarded them to the Melbourne Centennial Exhibition. A separate court, 50 feet by 60 feet, was set apart for the exhibits, which were principally from the Art, Architectural, and Engineering Departments. The quality of the exhibits compared favourably with those from other places.

The staff now included 9 instructors, and 41 teachers, 3 science and art masters, and 14 teachers and assistants at the branch schools, making a total of 67 persons.

On the expiration of the lease of the School of Arts Buildings, the headquarters were removed on the 1st November, 1888, to the Temperance Life Buildings in Pitt-street. In the following year the Hon. J. H. (now Sir Joseph) Carruthers, Minister of Public Instruction, who has always taken a deep interest in Technical Education, resolved, with the concurrence of the Cabinet, to place the work of the Technical College under the control of the State. On

6th November, 1889, a special and last meeting of the Board was held, when the Minister, accompanied by the late Mr. Edwin Johnson (Under Secretary), and Mr. F. Bridges (Deputy Chief Inspector), who was to be the Superintendent, attended to take over the direct control of the Sydney Technical College and Branch Schools. On the 15th of the month the Board was dissolved by proclamation, and Technical Education established as a branch of the Public Instruction Department.

The classes had now reached to 119, and the first step taken by the Department was to provide suitable accommodation for them. The site which had been recommended by the Board was purchased, and the work of preparing plans for the Sydney Technical College was begun.

At the beginning of 1890 a Branch School and School of Mines was established at Broken Hill, but the attendance was disappointing. West Maitland was also recognised, and a branch school formed there. Cookery in country towns received attention, and Goulburn was first visited, classes being carried on with success.

Technical Education made rapid strides under the new conditions, and the enrolments reached 6,580. In the following year the workshops in Kent-street were given up and transferred to their new and permanent home in Ultimo. Although the transfer appeared to be detrimental, the classes more than maintained their averages. This was the first step towards consolidating the work. Travelling lecturers in Geology, Horticulture, and Bee Culture were also appointed, and applications for their services were numerous. At Petersham a commodious building was secured for the technical classes there, and a good site was purchased at West Maitland at a cost of £4,000. Through the instrumentality of Mr. Carruthers, some £5,000 worth of the latest improved machinery was obtained from England for the Electrical Engineering, Mechanical Engineering, Chemistry, and Physics classes. The work steadily progressed and 8,466 enrolments were received, showing an increase of 1,886 over the previous year. During this year a Department of Sanitary Engineering was formed.

During the year ending in 1900, good progress was made. The individuals attending the classes were 8,625, as against 7,647 for the previous year—an increase of 978. The total number of classes in operation was 264. The students examined at the end of the year numbered 4,292, of whom 3,339, or 77·7 per cent., were successful. At the technological examination of the City and Guilds of London Institute 23 students of the Technical Colleges were examined, of whom 19 passed.

During 1900 new Technical Schools had been opened at Grafton for Freehand, Model, and Perspective Drawing, and at Chatswood for Book-keeping. Several Shorthand classes were arranged in the near suburbs for pupils attending the Public Schools. These classes were held after school hours, under technical teachers.

The total amount expended on Technical Education, including £4,618 14s. 1d. spent on Technological Museums, amounted to £36,696.

The congested condition of many of the trade classes, which had been previously reported, still remained, and there seemed no possibility of relieving it until the premises were enlarged.

A new building was in progress for the Goulburn branch.

At the centres Albury, Broken Hill, Bathurst, Granville, Goulburn, Newcastle, and Maitland, there were evidences of the growing popularity of the technical classes, for the enrolments increased. The manual training classes continued to be well patronised. No fewer than 915 enrolled, including the students in training. The pupils were drawn from thirty-eight schools.

Field work for the students attending the classes in Geology was instituted, and excellent results were obtained. The lectures were thus made more profitable and intelligent. Supplementary courses of practical geology were given in the laboratory.

The year 1901 was marked by the large increase in the enrolments, which reached 12,267 for all classes; and the Staff comprised 12 lecturers in charge of departments, 7 resident masters in charge of branch colleges, 94 teachers, and 20 assistant teachers—a total of 133 persons.

The new building for the Technical College at Goulburn was completed, at a cost of £8,081. A portion of the new College at Broken Hill was occupied; and classes were established in Coal-mining, Geology, and Mine Surveying in the Illawarra District.

During the year, in view of the overcrowded state of the classes and the number waiting admission, it was decided to adopt a rule giving precedence—First, to persons employed in the profession, trade, or business to which the class instruction specially related; secondly, to persons in other employments to which the instruction would be an auxiliary; and thirdly, to other applicants. (This procedure has now been practically discontinued, the need for it not being so urgent, and students are taken in order of application.)

Science Lecture Courses were given by the Resident Science Masters at Bathurst and Goulburn to the elder pupils attending the Public Schools there. Shorthand and Elocution were also taught to 570 school pupils. Ten workshops were in existence during this year, and instruction in Manual Training was provided for 866 pupils. Instruction in Physics was given to the pupils of the Boys' High School, and to the male students in training. The link between the Public Schools and the Technical Branch was thus becoming more complete.

The development of the previous year continued during 1902. The enrolments increased from 12,267 to 13,680. Of the total enrolments 2,077 were in the day classes, and 3,826 night classes which were held at the Sydney Technical College, and attended by 1,153 females. Two important classes—Veterinary Science and Pharmacy—were discontinued owing to small attendance. Mr. F. Wright had conducted the classes in Pharmacy for upwards of eighteen years. Classes for instruction in Meat Inspection and Sanitary Law were added to the Department of Sanitation, and an Advanced Joinery class was instituted during the year.

The inauguration of Day Engineering classes was an important feature of the year. A systematic course, extending over three years, was arranged, and students who passed the prescribed yearly examinations were awarded a diploma. There were forty-four who entered the course, and twenty-four passed.

It was still found that the existing buildings were inadequate to meet the demand for instruction. Representations were made for increased accommodation, and the purchase of the property adjoining the College premises was again urged, but the efforts were not successful.

A large number of books was added to the reference library, which was well attended by the students. The works of reference numbered over 4,000.

There were thirty-five new classes opened, making a total of eighty-six for pupils attending the public schools.

Mr. Norman Fitz, B.E. (Department of Mathematics), Mr. James Forde, B.A., B.Sc. (Department of Chemistry), and the Misses B. G. Langemeir and Mabel Sandes (Cookery) were added to the Staff.

During the year the suburban classes were increased by seventeen.

The number examined was 4,931, or 83 per cent. of the total enrolments.

Notwithstanding the taxed accommodation, there was a noticeable advance in the number of students attending the technical classes during 1903. The enrolments rose to 16,561, and these figures indicate the substantial growth of the Branch's operations.

The organised day classes for Mechanical and Electrical Engineering were attended by twelve and forty-two students respectively, making a total of fifty-four students.

Additional accommodation was provided for the Plumbing Students, whereby the enrolments could be increased by 100 students. Also a laboratory was erected for the dynamos and storage batteries. Classes in Printing—Composing and Machining—were opened during the year, and the students were housed in a temporary structure.

Mr. R. C. Simpson, A.K.C., was appointed to the charge of the Electrical Engineering Department, and Mr. C. Süssmilch was promoted to Teacher of Geology, Mineralogy, and Mining, also Messrs. A. H. Stewart, B.E., as Teacher of Metallurgy and Assaying, S. J. Johnston, M.A., B.Sc., as Teacher of Physiology, and J. V. Barker and W. S. De Wilde as Teachers of Composing and Machining Classes respectively, were added to the teaching staff.

At the request of the authorities of the Hobart Technical School, students of that institution, to the number of 105, were examined, of whom 79 passed and received the Sydney Technical College Certificates.

The examinations in connection with the City and Guilds of London Institute were also held, and of fifty-one persons examined, twenty-seven were successful.

In the country branches steady progress was reported as the results of the year's work.

The figures for 1904 show that the number enrolled exceeded the enrolments for the previous year. There were 16,589 as against 16,561, although the actual individuals were less.

New classes were established, the majority (84) being formed for pupils attending the public schools.

Several important changes in the staff took place. Mr. J. Forde, B.A., B.Sc., was transferred from Sydney to Broken Hill as Resident Master; Mr. W. J. C. Ross, B.Sc., from Bathurst Technical College to the Sydney Technical College, as Lecturer-in-charge of Department of Chemistry and Metallurgy; Miss A. M. Monro was appointed as Teacher of Cookery; and Mr. B. B. Loel, G.M.V.C., as Teacher of Veterinary Science.

The ordinary technical classes in the country decreased from 249 to 248.

The first three years' course of the day classes in Mechanical and Electrical Engineering, formed in 1902, was completed. Eleven students passed the final examination, and became

entitled to the College diploma. Mr. A. B. B. Ranclaud, who passed with distinction, won a P. N. Russell scholarship at the Sydney University.

The industrial depression had a serious effect upon the country classes, consequently the attendance fell from 4,200 to 3,807. At the Central College the enrolments only reached 5,934, and the decrease is attributed to the idea which prevailed that the classes were full.

The total expenditure for 1904 was £38,847.

At the annual examination 4,290 students presented themselves, and 2,755 were successful. The percentage of passes was 73.

Ninety students at the Hobart Technical School were also examined, and 65 per cent. of the examinees passed.

There were forty-six candidates for the City and Guilds technological examinations, of whom thirty-four succeeded in satisfying the examiners.

The work of the Technical Education Branch embraces matters relating to—(a) Sydney Technical College, (b) Country and Suburban Schools, and (c) Public Schools. In 1905 there was a falling off in the number of classes from 647 to 625, the enrolments and fees consequently were less than for 1904.

Several changes were made in the teaching staff. Mr. James Nangle, F.I.A., was appointed Lecturer in charge of the Department of Architecture, *vice* Mr. Cyril Blacket, resigned. Mr. James Hanley was transferred from the Newcastle Technical College to take charge of the Fitting and Turning classes at the Central College. Dr. T. W. Sinclair was appointed Lecturer in Sanitary Law and Infectious Diseases, *vice* Dr. Stokes resigned.

The Superintendent made an attempt to interest various country towns in the question of Technical Education by addressing circulars to municipal bodies. The response, however, was disappointing.

The matter of making fuller provision for the educational training of teachers, both from a theoretical and practical standpoint was considered, and developments in this direction took place in several of the science courses, more particularly in Botany and Zoology. In Physiology a course of practical work was introduced, and students are now required to pass in both theory and practical work to become eligible for a certificate in the subject.

The technological examinations in connection with the City and Guilds of London Institute were discontinued.

Eleven of the day engineering students qualified for the diploma in Electrical and three for Mechanical Engineering. Mr. E. P. Norman, the student who passed with great distinction, won a P. N. Russell Scholarship at the Sydney University.

The accommodation was again made a matter of special representation, and it was pointed out that so far as the Sydney Technical College buildings were concerned, they not only gave no proper opportunity for the teaching of a number of subjects, but also actually did not accommodate applicants anxious to enter. The State had really to refuse to provide technical education for its sons and daughters. The Science and Engineering Departments needed to be extended and properly equipped with up-to-date appliances.

At the end of 1905 there were 3,741 volumes in the library, besides 1,067 bound periodicals; although there was money voted for the library each year, the reference books obtained were proportionately small compared with the number of branch colleges to be supplied.

The early history of technical education in this colony must always be associated with some few men who were far-sighted enough to perceive the enormous influence for good which would be exerted on the industrial prospects of the country by a thorough training in the "mechanic arts," of the youth and manhood of the community. The names of several of those have been already mentioned, but prominently among all of them stands that of Sir Joseph Carruthers, who, when Minister of Public Instruction, inaugurated the Technical Education Branch of that Department, and erected the splendid buildings in which the work is now being carried on.

Sir Joseph Carruthers was born in Kiama in 1857, and spent the early years of his life there, but while still a young boy came with his parents to Sydney, where his school-day experiences began at the William-street and Fort-street schools. It is most interesting to recollect that at that time the head master of the latter school was the late Mr. F. Bridges, who was appointed by the then Mr. Carruthers first Superintendent of Technical Education. When only ten years of age Sir Joseph Carruthers left school to take a position in a Sydney warehouse, but after twelve months his health gave way, and he was sent to Mr. Metcalfe's school at Goulburn, where he remained three years. The change thoroughly restored his constitution, and in 1872 he matriculated at the Sydney University, and entered on what proved to be a most successful academic course. The pursuit of



THE HON. SIR JOSEPH CARRUTHERS.

learning did not absorb the whole of Sir Joseph's time during his college career, for he was one of the most valued members of the 'Varsity "A" Football Team, and a crack batsman of the Cricket Club in its palmy days. He is to-day as interested in sport as ever, and has the reputation of being an expert with gun and rod.

After graduating at the early age of eighteen years he spent three years under articles to a leading firm of solicitors and was then admitted to the practice of his profession, in which it may be confidently affirmed, no man has borne a more honored name.

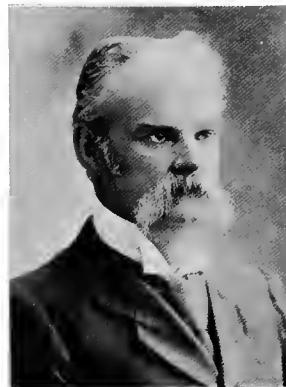
His political life began in earnest when, in 1887, he was returned for Canterbury at the head of the poll by the remarkable majority of 4,300 votes—a majority that steadily increased till at the election of 1891 it reached the immense number of 7,300 votes. In the Legislative Assembly he occupied a position of influence and respect, inasmuch as he is recognised as a keen, yet courteous, debater, as well as being especially expert in the framing of legislation.

Sir Joseph Carruthers' first office as a Minister of the Crown, was when, in 1889, under the leadership of Sir Henry Parkes, he took charge of the Department of Public Instruction. Then it was that he established the present Department of Technical Education, and, by his now famous master-stroke of policy, built the Technical College and the Technological Museum. Equally important as the efforts he has made on behalf of Technical Education are those dealing with the lands of the colony. He holds strongly to the view that in the land question is to be found the solution of many of the grave problems of the day. On accepting office under Mr. Reid as Secretary for Lands he set himself to work to reform the then existing law in relation to the alienation and occupation of the Crown Lands, and the result of his labours was the passing of the Crown Lands Act of 1895, of which he was the author. This measure has been generally recognised as the most liberal ever passed. It introduced new methods of acquiring land, such as homestead selection and settlement leases, and altogether the Carruthers Act has marked an important advance in the history of land legislation in New South Wales. Under this law agricultural settlement has proceeded at an unprecedented rate in the Central Division of the colony, and an extraordinary demand for suitable land for agriculture has sprung up. By this measure alone he has rendered substantial service to the country. His magnificent work as Premier of the Carruthers Governments is too recent and fresh before the world to need reference here, but amid all his great work he has always maintained his interest in the College, and but for the serious illness which compelled his resignation from his second Premiership, would have shown further practical sympathy by providing the much needed extra extension, and so completing the magnificent buildings which will ever remain as a monument to his fearless energy and far-seeing foresight.

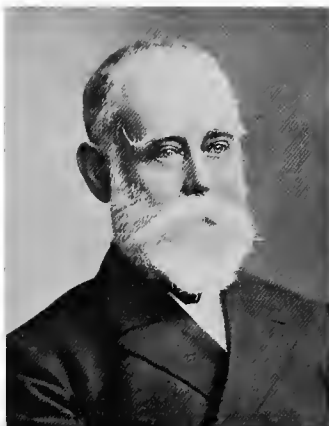
Since Sir Joseph Carruthers took over Technical Education, constituted it a special branch of the Department of Public Instruction, and placed it under the control of a specially appointed administrative head, there have been (exclusive of the present occupant of the position) five Superintendents. One, the first, and perhaps the greatest among them all, has crossed the bourne to a well-earned rest; the others have been transferred to various positions, but any record of the last twenty-five years of Technical Education in this



MR. MAIDEN,
Second Superintendent, from 1892 to 1893



DR. MORRIS,
Third Superintendent, from 1893 to 1901.



MR. BRIDGES,
First Superintendent, from 1889 to 1892.



MR. COOPER,
Fourth Superintendent, from 1901 to 1904.



MR. KNIBBS,
Fifth Superintendent, from 1905 to 1906.

State would be most incomplete without some reference to those gentlemen, all of whom, in a greater or less degree, have helped on the forward march of Technical Education in New South Wales.

FREDERICK BRIDGES: FIRST SUPERINTENDENT, 1889 TILL 1892.—When it was decided to place Technical Education directly under the control of the State, the position of First Superintendent was offered to the late Frederick Bridges, at the time Deputy Chief Inspector of Schools. No better appointment could have been made, and in selecting him for this very important position, those responsible showed very sound judgment. Mr. Bridges worked his way steadily through all the grades of the teaching service, from that of first Pupil-teacher appointed in the State to the Head-mastership of the Model Public School, Fort-street; then through the various grades of Inspectors, till he finally reached the Under Secretary's chair. His outstanding characteristics were—a strong personality, an incisive masterful manner, great powers of organisation, and a wonderful influence over men. All these qualities were brought into action when the great but unconsolidated organisation of Technical Education was handed over to him by the Technical Board of Education in 1889. His name is revered in the College to this day. Of him it may be truly said—

He builded well, not for a day,
But for all time.

J. H. MAIDEN, ESQ., F.L.S.: SECOND SUPERINTENDENT, FROM 1892 TO 1893.—On the promotion of Mr. Bridges to the Office of Chief Inspector he was succeeded by Mr. J. H. Maiden, who combined the duties of Superintendent with those of the Curator of the Technological Museum, which position he had held for some years. In 1893 he was appointed Director of the Botanic Gardens.

R. N. MORRIS, ESQ., M.A., LL.D.: THIRD SUPERINTENDENT, FROM 1893 TO 1901.—During Dr. Morris's term of office he visited Broken Hill, reported on Technical Education needs, and recommended the erection of a Technical College in that city. The College, which is one of the finest buildings in Broken Hill, was built and opened in his time. The Technical School at Wollongong, with the classes in the immediate coal-mining centres, the Technical School at Albury, various classes in the mining townships round Newcastle and at West Maitland, were established by him. He lectured in various towns in the State, with a view to establishing classes. He strongly advocated the acquirement of more land for the purpose of technical extension, and pointed out the great need there was to provide accommodation for the many students anxious to further their education. Dr. Morris was appointed Chief Examiner under the Department of Public Instruction, and was succeeded in 1901 by D. J. Cooper, Esq., M.A., Senior Inspector of Schools.

D. J. COOPER, ESQ., M.A.: FOURTH SUPERINTENDENT, FROM 1901 TO 1904.—Mr. Cooper entered on his duties as Superintendent of the Technical College in 1901. During his regime he introduced some important measures, chief of which were—(a) Establishment of Day Engineering Classes, 1902; (b) Classification of student. Previous to his taking charge there had existed independent day classes. He co-ordinated the various courses of day instruction and established the Day Engineering classes.

The classification of students was as follows:—

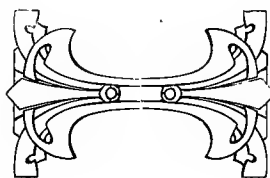
- (a) Apprentices.
- (b) Students desirous of obtaining instruction in the trade they had selected.
- (c) All others.

Precedence was given to apprentices.

Mr. Cooper erected the technical buildings at Lithgow, established the workshops at Newcastle, and revived the Printing Classes at the Sydney Technical College. In 1905 he was made Principal Senior Inspector of Schools.

G. H. KNIBBS, ESQ., F.R.A.S. : FIFTH SUPERINTENDENT, FROM 1905 TO 1906.—Mr. Knibbs succeeded Mr. Cooper in 1905. The most important matters inaugurated by him were:—

- (a) Introduction of Term Examinations.
- (b) A system of examination by Technical Teachers of the College.
- (c) The effort made to enlist the sympathy and support of municipal bodies throughout the State in Technical Education matters.
- (d) The delivery of a series of lectures under the auspices of the Labour Council.
- (e) The securing of a special grant for equipping libraries in country colleges.



III.--The Present State of Technical Education in New South Wales.

THE educational statistics for 1908, which have just been completed, record an aggregate enrolment of 18,490 technical students, and a receipt of £14,176 in fees. The attendance is distributed as follows: at the Central Technical College, Harris-street, Ultimo (Sydney), 7,320; at Suburban Technical Schools, 2,344; at Country Technical Colleges and Schools, 6,411; at Public Schools in the Metropolitan District, 125; at Suburban Public Schools, 1,109; and at Public Schools in the Country Districts, 1,181.



J. W. TURNER,
SUPERINTENDENT OF TECHNICAL EDUCATION.

General Description of the Sydney Classes.

A GENERAL description of the classes as they at present exist in the Central Technical College and its branches, and a brief reference to the present work and conditions of the College appear in the following pages. More information in detail on these points is supplied in a later part of the monograph:—

DEPARTMENT OF AGRICULTURE.

The Department of Agriculture in the Sydney Technical College has a large enrolment of students. The Syllabus includes Elementary and Advanced Agriculture, Elementary Veterinary Science, and Farriery. In addition to the regular Evening Classes there are an



THE MAIN FRONT OF THE SYDNEY TECHNICAL COLLEGE BUILDINGS FACING MARY ANN STREET.
[See plans.]

Afternoon Class with a very practical course, and Special Classes for Dairy Science. A class in Agriculture is conducted in the Granville Technical School. The subject of Veterinary Science is among the most popular in the College, and in country centres applications for the formation of classes in this subject are numerous. Only one school of Veterinary Science is

in operation in the country, and that is established in Trangie under the local Medical man, an enthusiast among horses. The question of extending these classes comes within the scope of Technical Education, but the difficulty lies in finding suitable applications for the position. The Superintendent's scheme of itinerary work was vetoed when the Department of Agriculture was formed.



DEPARTMENT OF ARCHITECTURE—INCLUDING BUILDING TRADES CLASSES.
JONES STREET FRONT.

The Agricultural Continuation School at Hurlstone, Ashfield, near Sydney, has proved a success. The enrolment since it was inaugurated in April, 1907, has reached over 70, fully half of whom are in residence. Three of the students on the completion of the two years' course gained scholarships, and entered the Hawkesbury Agricultural College, where the two years' course is recognised as equivalent to the first year in that Institution.

The Continuation School at Goulburn has only been in operation a few months. It is the only one of the five Continuation Schools in existence up to date which provides a training in Sheep and Wool. In establishing these schools the chief aim is to orientate the teaching.

DEPARTMENT OF ARCHITECTURE.

All the classes in this Department are numerous attended. Quite recently new buildings have been erected for the Architectural students with an arrangement of the floors and classrooms to permit of concentrated organisation. The ground floor is fitted up with labour-saving machinery, with which students should be acquainted; the first floor is occupied by, probably, the largest wood workshop in the Commonwealth; and the second floor contains draughting rooms and a large lecture hall. The College is very largely indebted to the Institute of Architects, Sydney, for the warm interest its members take in this branch of work.

DEPARTMENT OF ART.

The teaching of art subjects occupied a very early and a very prominent place in the History of Technical Education in this State. As far back as 1878 M. Lucien Henri conducted classes in drawing under the School of Arts *regime*.

The present classes are well attended, the teaching staff is zealous, and there is a fine *esprit de corps* among the students.

The latest addition to the Art work of the College is that of Pottery. A full-time teacher is now in charge of the class for Ceramic Art, and opportunity exists for our students to show original work.

DEPARTMENT OF INDUSTRIAL AND DECORATIVE ART.

The students attending the classes in the Department of Industrial and Decorative Art are among the most enthusiastic and earnest workers in the College. The classes are arranged to give instruction in the various branches of Decorative Art. The students are afforded an opportunity of gaining instruction useful to them in the particular branch in which they are employed, and also a practical knowledge of other divisions necessary to their advancement. The Syllabus embraces House-painting, Graining and Marbling, Sign-writing, Elementary Decoration, Art Decoration, Illumination, Design. In several subjects the course is for two years, while in some, three years are necessary.

A class for Decoration of Wood, Metal, Glass, &c., was started in the year just ended, and has been well supported.

BREADMAKING CLASS.

One of the most important classes established during the year was that of Breadmaking. A series of lessons dealing with the scientific aspect of the trade was delivered to appreciative audiences of master bakers and operatives. The attendance at the classes has not been up to expectation, but a promise of better support on the part of those for whom the instruction was intended has been made.



TECHNOLOGICAL MUSEUM—HARRIS STREET FRONT.

The value of the instruction is recognised beyond the limits of our own State, for from distant parts of the Commonwealth and from New Zealand applications for a précis of the lecturer's notes have been received.

DEPARTMENT OF BIOLOGY.

This Department includes Botany, Physiology, and Zoology. Classes in the three branches are in existence and the roll is a large one, in which the names of Public School Teachers in the State are very frequently found.

The course in Botany covers two years; that in Zoology, two years; and that in Physiology, one year.

The recent teacher of Physiology and Zoology has been promoted to the position of Assistant Microbiologist, and two teachers holding the degree of B.Sc. have just been appointed in his place.

DEPARTMENT OF CHEMISTRY AND METALLURGY AND ASSAYING.

The Chemical Laboratory which stands in the middle of the College yard, is a plain rectangular one storey building. It has undergone little or no alteration since it was erected, and, in consequence, does not compare favourably with more modern laboratories. It has, however, been, and still is, the scene of much good work. Additions are now in contemplation which will bring it more into harmony with present-day requirements.

Classes in Chemistry are conducted in the following towns:—Broken Hill, Albury, Cobar, Dubbo, Goulburn, Bathurst, Newcastle, West Maitland, Tamworth.

At the Central College the courses for Inorganic Chemistry (Theoretical) cover a period of three years; those of Inorganic Chemistry (Practical), ordinary course, two years. There are also advanced courses in Practical Chemistry, two years, and a special course mainly intended for Public School Teachers, who attend on Saturday mornings. The course in Organic Chemistry (Theoretical) lasts for two years, and for Organic Chemistry (Practical) also two years.

The courses in Metallurgy and Assaying extend over two years.

The laboratory is open to those students who desire practical lessons in the methods of determining the value, &c., of commercial articles.

COMMERCIAL DEPARTMENT.

The Commercial Classes in the College are Book-keeping, Shorthand (Pitman's), Business Correspondence, Caligraphy, and Modern Languages—French, German, Italian.

The instruction is given in the evening. At present students join the class for the subject in which they need instruction, and there is no properly defined commercial course. There are, however, all the conditions in the College and the Museum for a Commercial School.

DEPARTMENT OF DOMESTIC SCIENCE—COOKERY, &c.

The year just ended has seen considerable extension in the matter of extra accommodation and equipment, and one of the Departments to benefit in this way has been that of Cookery. The improvements in this branch of Domestic Science include class-rooms in Cookery, Laundry work, and Housewifery. There are three well appointed kitchens, a fine lecture-room, a large dining-room, a laundry, and a model room for instruction in Housewifery. The accommodation is already taxed to the utmost, and students are already waiting their turn for admission.

The students may be classified as follows:—

1. Young ladies undergoing a training for the management of their own homes.
2. Young ladies undergoing a training as teachers of Domestic Science—admission by competition.
3. Young ladies from the Sydney Training College.
4. Employees engaged in the daytime—for the latter a special Evening Course at reduced rates is provided.



THE SYDNEY COLLEGE QUADRANGLE.

From the Main Entrance looking east towards the Harris-street end :—Showing portion of the Chemistry Block, the Domestic Science and Cookery Block, entrance to the Women's Handicrafts, the Agricultural Class-rooms and the Large Lecture Hall, and part of the Printing Shop and College Carpenter's Shop.

[See plans.]

DEPARTMENT OF WOMEN'S HANDICRAFTS—DRESSMAKING, &c.

The classes included under this branch of Domestic Science are Dressmaking, Ladies, Tailoring, Plain Sewing, Women's Handicrafts, Millinery, &c., and the instruction covers a one year's course, followed by an Advanced Course. There is also a Teachers' Course for students 19 years of age and over, who have passed well in the two years. There is a demand in the country for trained teachers from the College, and several of our young girls are now conducting classes in the country towns. As is the case with the other side of Domestic Science, the accommodation for Dressmaking is inadequate even for the present attendance.

ELOCUTION CLASS.

This subject has general support in the suburbs, and classes are conducted in several Public Schools in the interests of the senior pupils. There is one class in the Central College. The teachers are generally young ladies who have been trained in the city in one of the schools for voice production.

DEPARTMENT OF ELECTRICAL ENGINEERING AND PHYSICS.

The organised Day Classes, formed in February, 1902, extend over a period of three years, during which systematic instruction is given in such theoretical and practical subjects as are necessary to qualify young men of fair education for the lower branches of Mechanical and Electrical Engineering. Much of the students' time, especially in the second and third years, is devoted to actual practice in the workshops and laboratories of the College. Candidates are not admitted under the age of 16 years. An entrance examination in English, Arithmetic, and Algebra is held in January in each year.

The Evening Classes, to which no entrance examination is required, extend over a period of five years. The Syllabus includes instruction in Geometry, Algebra, Arithmetic, Chemistry, Trigonometry, Physics, Electrical Engineering, Applied Mechanics, Mechanical Drawing, Fitting and Turning.



THE SYDNEY COLLEGE QUADRANGLE.

From the Main Entrance, looking west towards the Jones-street end:—Showing portion of workshop range on left, including the Wool-classing, the Patternmaking and Plumbing Workshops, and the large Architectural Buildings forming the end of quadrangle with the Sanitary Engineering Lecture-room and Laboratory and the Erecting Shop in front with College Plumbers' Workshop and Drainers' Examination Yard.

[See plans.]

The buildings are inadequate for the work to be done, and are unsuitable for later development. A portion of them has been condemned, and a plan for better and more modern accommodation is now being prepared.

DEPARTMENT OF MECHANICAL ENGINEERING.

Legislation of an intimate and exceptional character affecting the apprentice in this State has constituted the Technical College a portion of the machine for dealing with this very important individual.

In a recent award of the Arbitration Court, the President delivered the following judgment in the matter of the dispute between the Amalgamated Society of Engineers, Industrial Union of Employees, and the Iron Trade Employers' Association, Industrial Union of Employers:—

"Apprentices and Improvers.—All boys shall be apprenticed for five years, either by verbal or written agreement, to learn one of the following trades: Fitter, turner, fitter and turner, smith, coppersmith, brass-finisher, or pattern-maker. Any such written agreement may provide for the transfer of the boy, if the master should be unable to provide him with continuous instruction, to some other employer or employers. A boy may be taken on probation for not more than four months, and if he is apprenticed, such time of probation shall count as part of his five years. If facilities are provided at the Technical College, any boy apprenticed to a Sydney master engineer shall, during at least two years of his apprenticeship, attend on



SYDNEY COLLEGE QUADRANGLE.

From the Museum looking west along Workshop Range:—Showing part of back of Cookery Block, the Testing-machine room, Foundry, Fitting and Turning, and Blacksmiths' Workshops, and side of Chemistry building, with the Sanitary and Architectural buildings in distance.

[See Plans.]

at least two nights in each week the classes of the said College in engineering or in the engineering trade to which he is apprenticed, the fees thereof to be paid by the employer; that such boy shall not be admitted as journeyman unless he obtains certificates from the Technical College of having so attended. When a boy is out of his time he may, if he is not yet a competent tradesman, able to earn the minimum wage, work as an improver for not more than two years. During such two years he shall, if paid at time rates, be paid at a rate not less than 1s. per hour during the first year, and at a rate not exceeding 1s. 2d. per hour during the second year. Every apprentice shall, at the end of his time, be given a certificate of service and competency by the employer in whose shop he has finished his time.

“Duration of Award.”—This award shall come into operation on June 19th, 1908, or on any subsequent date to which it may hereafter from time to time be postponed, by order of the Court, and shall continue in force for a period of three years thereafter.”

Industrial Disputes Act, Clause 7 (1)—Awards, &c.

“All awards, orders, and directions of the Court of Arbitration, and all industrial agreements, current and in force at the commencement of this Act, shall, until rescinded under this Act, be binding on the parties and on the employers and employees concerned—

(a) For the period fixed by the said Court, or by any such award, or order, or agreement; or

(b) Where no period is fixed, for one year from the first day of July, one thousand nine hundred and eight;

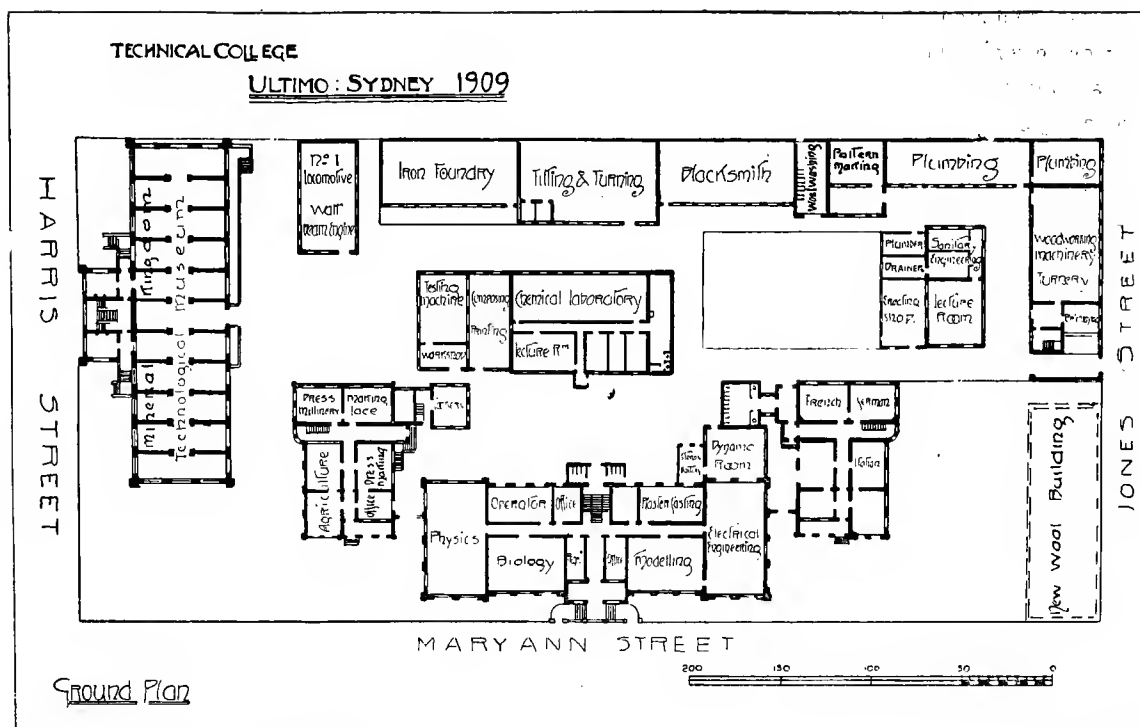
and the same may be enforced under the provisions of this Act.”

If this award is to have its due effect, and Clause 7 of the Industrial Disputes Act makes clear what has to be done, then the Technical Colleges will have to stand in very close relation to the apprentice.

To meet this extra demand, and to provide for the large number of students previously waiting admission, extensive additions have just been made to the Mechanical Engineering workshops, supplying accommodation for another 100 students. The chief improvements consist of a commodious workshop and a large and well-furnished lecture-room. The equipment of the workshops generally, has kept pace with the growing popularity of the Department; and to-day the various machines for class instruction are acknowledged to be the most modern and most suitable to be seen in the Commonwealth. The Syllabus includes instruction in Mechanical Drawing, Applied Mechanics, Blacksmithing, Patternmaking, Boilermaking, Fitting and Turning, Ironfounding, Slide Rule, Motor-driving, Machine-erecting, the two last named having been introduced quite recently.

Students are also practically instructed in the strength of materials, and the modes of testing structures and machinery, &c. Two machines are used for this purpose—100-ton, by Buckton & Co., Leeds; 50,000 lb., by Olsen, Philadelphia.

There are classes in Mechanical Engineering in Newcastle, Goulburn, and Broken Hill. The workshop in Broken Hill has recently been fitted up with valuable machinery and apparatus.



DEPARTMENT OF SANITATION.

This is among the most valuable sections of Technical College work. There are six courses of study, as follow:—

Sanitary Engineering.

Course A.—Practical Lighting, Heating, Cooling, and Ventilation.

Course B.—Water Supply, Sanitary Fittings and Drainage, Sewage and Refuse Disposal, on a small scale.

Course C.—Municipal Sanitation, Public Water Supply, Sewerage and Sewage Disposal, Disinfection, and Nuisance Prevention.

Course D.—Sanitary Engineering (Sanitary Inspector's course).

Course E.—Elementary Sanitary Engineering (Day Course).

There are, in addition, Special Courses for Sanitary Law and for Meat Inspection.

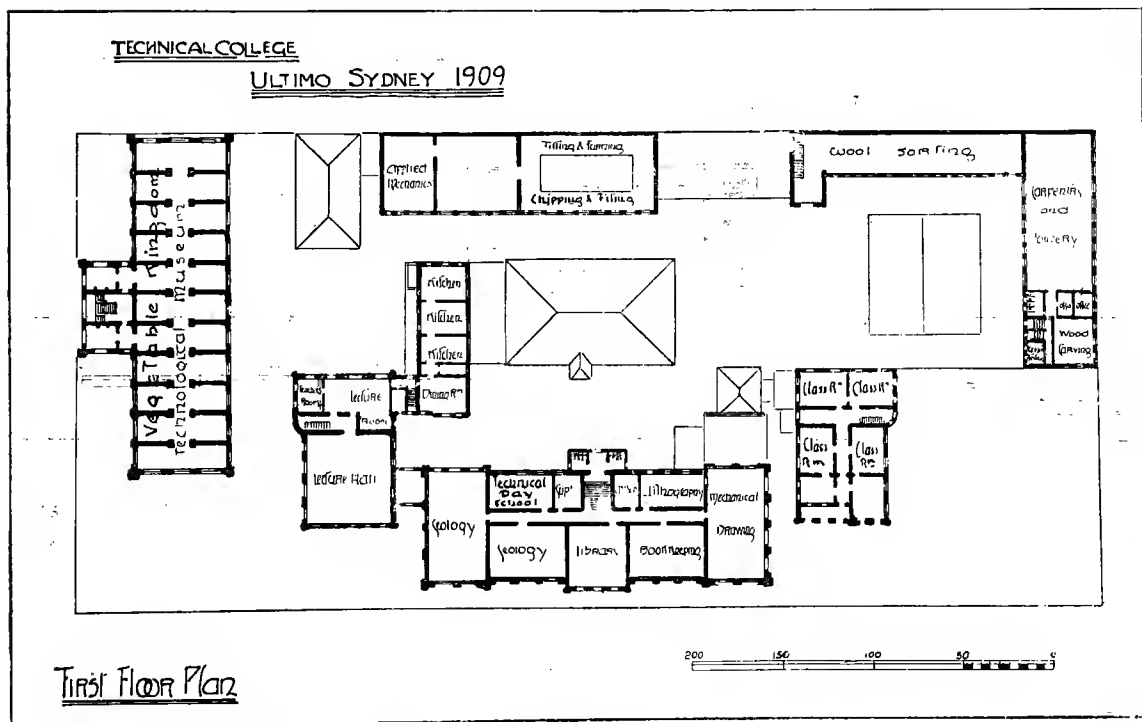
Practical, General, and Sanitary Plumbing.

This class is one of the most practical and, at the same time, one of the largest in the College. The work accomplished, both in regard to finish and utility, is acknowledged by master plumbers of the city and by experts from other States to be of the highest excellence. The course extends over a period of four years, and in addition there is a special advanced class

There are classes for Plumbing in Newcastle, Goulburn, Maitland, Granville, and Bathurst.

The buildings recently vacated by the students of Architecture are now occupied by the students of Geology, Mineralogy, and Mining. The full course of instruction extends over three years, and consists of lectures and practical classes. Field excursions for practical instruction are held from time to time, on Saturdays and holidays. An Instructor in Mine Surveying has been added to the Central College Staff.

Well-organised classes in Coal-mining and Mine Surveying are in operation in the Coal Centres around the towns of Newcastle, Maitland, and Wollongong.



MATHEMATICS.

It is surprising how badly prepared in Mathematics the majority of candidates who present themselves at the Entrance Examinations are. The subject is one deserving the most careful attention on the part of our Primary and Secondary School Teachers. If boys are to succeed in the engineering world they must receive a good foundation in mathematical subjects. In the Technical Day School just established within the Technical College, which prepares boys for admission into the Engineering, Mining, or Architectural Departments later, eight hours every week are devoted to Mathematics. It is pleasing to note the large attendance of students in the Evening Classes for this work. The plan of having separate teachers for the Day and Evening Classes in Mathematics in the Sydney Technical College is giving the best results.

PRINTING DEPARTMENT.

The two classes under this Department—Composing and Machining—are very popular in the College. Unfortunately the work has to be carried on under difficulties in regard to accommodation. One of the earliest improvements to be made in the College buildings will be that of new rooms to take the place of the wooden structure which has been condemned.

Additional classes for other branches of the Printing Trade are now in course of formation.

LITHOGRAPHY, PHOTOGRAPHY, PHOTO-ENGRAVING CLASSES.

The classes in Lithography and Photography have been continued throughout the year 1908, and that of Photo-Engraving came into operation about the middle of the year.

The course in Lithography covers two years; that in Photography two years; and that in Photo-Engraving three years. In the last class named the first year is devoted to Line and Half-tone Negative making by the Wet and Dry Plate Processes; the second year to Printing and Line and Tone Etching; in the third year to Tricolour and Isochromatic Work.

CLASSES FOR RAIL-CARRIAGE BUILDING AND ROAD-CARRIAGE BUILDING.

These two classes have each a two-years' course and they are in operation two nights in each week. A well attended class in the former branch is also held at the Granville Technical College.

CLASS IN SADDLERY, &C.

This class was instituted last year, and the students meet in the building of the School of Bootmaking, Erskineville. The course of instruction in Saddlery and Harness-making is specially adapted to impart to apprentices a thorough and practical insight of their work, a technical knowledge of the nature of the materials used, and practical demonstration of how to apply them to advantage in the manufacture of the various articles required. The class meets twice each week.

THE DEPARTMENT OF SHEEP AND WOOL TRAINING.

This great industry of the State is well represented in its largely attended Technical Classes. The applications in 1908 were so numerous that an additional building was rented to accommodate the increased attendance. The instruction given embraces most phases of the work connected with the industry. The classes have been extended to the country, and are well supported in Goulburn, Bathurst, Armidale, Tamworth, Scone, Moss Vale, Young, Dubbo.

A class for sheep-shearing machine experts came into existence at the beginning of the year just ended. It was formed for the purpose of preparing much-needed experts capable of driving steam and oil engines, erecting and repairing shearing machinery, and sharpening cutters. It promises to be a popular as well as useful class.

TAILORS' CUTTING CLASS.

Among the numerous Trade Classes conducted in the College during the year 1908, that of Tailoring has not been the least important or successful. The course of instruction is designed for persons desirous of learning the art of Tailors' Cutting. Instruction is divided into two courses—Ordinary and Advanced—both of which may be taken in the year; but students must take the ordinary course before they are eligible to proceed with the advanced. Students are advised to take a course of Freehand Drawing and to attend the lectures on the anatomy of the human figure.

Country and Suburban Colleges and Schools.

BATHURST TECHNICAL COLLEGE was one of the first to be established, under Mr. W. J. C. Ross, B.Sc., and it has been in existence since 1885, Mr. T. C. Dwyer, B.Sc., was appointed Resident Science Master in 1906. The classes were then poorly attended, but now the following subjects are taught:—Chemistry (theoretical, practical, and agricultural); Geology; Mineralogy; Assaying; Physics; Mathematics; Art, Elementary and Advanced; Book-keeping; Short-hand; Domestic Science; Cookery; Laundry Work; Carpentry; Joinery; Wood-carving and Wood-turning; Plumbing; and Wool-classing.

The total enrolments last year were 777.

The introduction of Wool-classing has met with considerable support, and the instruction is appreciated. The Class has met a long-felt want.

A connecting link between the Public and other Schools by providing suitable courses of Science Lectures, instruction in Wood-working and Wool-classing has been made, which will serve as a feeder to the Technical Classes later on. The interest of the youths, and girls of the district has, therefore, received practical consideration.

NEWCASTLE TECHNICAL COLLEGE is situated in the centre of a maritime, mining, and general industrial population. The residents, therefore, find employment in many channels. To meet the circumstances the range of subjects is an extensive one, and has been made suitable for the conditions which obtain. The classes in operation are:—Chemistry (theoretical and practical), Mineralogy, Metallurgy, Assaying, Geology, Physics, Mathematics, Coal-mining, Mine Surveying, Applied Mechanics, Mechanical Drawing, Pattern-making, Boilermaking, Blacksmithing, Fitting and Turning, Plumbing, Carpentry, Wood-carving, Wood-turning, Dress-making, Millinery, Book-keeping, Shorthand, French, German, and Art (elementary and advanced).

Pupils of the Public Schools attend the Workshops for instruction in Manual Training, and the elder girls are taught Cookery.

A Technical Continuation School has recently been established, which provides a special course of instruction for lads over 14 years of age, who intend following the trades connected with the engineering industry.

Special facilities are offered for those engaged in Mining, whereby students can obtain the requisite knowledge to fit them for higher positions.

The various classes are on the whole well patronised, but the limited accommodation prevents increased enrolment.

In the surrounding district special classes are established, which are under the direction of the Resident Master.

The total enrolments for the College and branch classes were 2,091.

MAITLAND TECHNICAL COLLEGE has been established for many years under the present Resident Master, Mr. Hollings. The classes in operation are:—Freehand, Model, Geometrical, Perspective, Mechanical, and Trades Drawing; Modelling and Advanced Art, Geology, Botany, Chemistry, Building Construction, Carpentry, Wood-turning and Wood-carving, Dressmaking, Cookery, Book-keeping, Shorthand, and Mathematics.

For students resident in the outlying towns special classes have been arranged, and are conducted either by a member of the College Teaching Staff or by a Local Teacher.

In this way the requirements of the district are met. The classes are well attended, and no less than 1,357 were enrolled during the year.

For some years the need of a new building has been felt, and a tender for the erection of suitable premises of most modern design for all classes has been accepted.

The attendance has fluctuated from year to year, but the support given to the Technical Classes has justified the expenditure of a large sum of money to provide and equip a Technical College.

GOULBURN TECHNICAL COLLEGE is conducted in a fine building, and provides instruction in several scientific, art, mechanical, and commercial subjects. The requirements of an important city like Goulburn are varied, as it is surrounded with various interests. There are the agricultural, commercial, and manufacturing industries to be considered, and provision made for those engaged in them. Whenever support is forthcoming, the Resident Master, Mr. Sach, has arranged for classes to meet the special needs of those desirous of instruction, hence the many classes which are in operation. The main building is set apart for teaching Chemistry (theoretical and practical), Assaying, Mineralogy, Geology, Mathematics, Physics, Art (elementary and advanced), Mechanical Drawing, Book-keeping, Shorthand, Typewriting, Domestic Science, Cookery, and Laundry Work. Classes for Carpentry, Wood-turning, Carving, Trades Drawing, and Building Construction are held.

A special building has been erected for teaching Wool-classing, and the Plumbing and Engineering Trades are housed in a separate building.

Last year a Technical Continuation School was inaugurated, and at present is poorly attended.

In country towns the enrolments fluctuate, but the support accorded to the College is good.

The enrolments last year reached 1,063, and when the building which is in progress for accommodating the Domestic Science Classes is ready for occupation the attendance will be increased.

ALBURY TECHNICAL COLLEGE is under the direction of Mr. Wm. Powrie, and classes in Freehand, Model, Geometrical, Perspective, and Trades Drawing; Carpentry and Joinery, Wood-carving, Theoretical and Practical Chemistry are held each week.

Manual Training Classes are also conducted for the elder pupils of the Public Schools.

As far as practicable the requirements of the district are met, and classes are formed whenever sufficient support is forthcoming.

Recently Agriculture has been added to the list of subjects, and it is intended to extend the usefulness of the College by providing other classes.

The enrolments for all classes last year reached 206. For some time the prominent residents have been anxious to secure a new building, but at present the support given to the existing classes does not justify a large expenditure of public money.

BROKEN HILL TECHNICAL COLLEGE has a large and efficient Staff of Lecturers and Teachers under the supervision of Mr. Jas. Forde, B.A., B.Sc. The building provides for scientific, industrial, and commercial classes, in which 1,109 students were enrolled.

Special attention has been given to the local needs, consequently the provision made for giving instruction in Theoretical and Practical Chemistry, Organic Chemistry, Assaying, Metallurgy, Geology, Mining, Physics, Mathematics, and Mine Surveying is of the best, and students are enabled to secure a thorough scientific training, which will fit them for important positions connected with the mines.

Freehand, Model, Geometrical, and Perspective Drawing are also taught, and to encourage the higher branches of Art, arrangements are made for suitable works to be periodically sent from the Art Gallery, Sydney. The industrial side is also provided for, and Motor-driving, Carpentry and Joinery, Fitting and Turning Classes are in operation. Domestic Science, including Plain and Advanced Cookery and Laundry Work, also Dressmaking and Millinery, are taught. Thus ample opportunities are afforded to young people who desire to acquire the knowledge which is helpful in their respective callings.

A most liberal equipment in the Engineering and Physics Department has recently been supplied. In regard to these branches of Technical Instruction, it will not be necessary now for Broken Hill students to go out of their own city.

GRANVILLE TECHNICAL COLLEGE has been under the charge of Mr. J. B. Brown since its inception. Situated in an industrial centre, the needs of the people have been specially considered. The classes have always received hearty support, and under the guidance of Mr. Brown a solid development has taken place each year. Most of the students are engaged in the engineering and allied trades, consequently the subjects taught are those which bear on the respective industries scattered throughout the district. Classes for Mathematics, Geometrical, Perspective, Mechanical, Freehand, Model, &c., Drawing are attended by a large number of students, whilst the Trade Classes—Carpentry, Plumbing, Carriage-building, and Boilermaking are equally well supported. Instruction in Agriculture has also been given for many years, and the class is a

popular one. Shorthand and Dressmaking are amongst the subjects, and Fitting and Turning and Blacksmithing have been recently added.

There were 1,041 actual enrolments last year.

A Technical Continuation School for lads over 14 years of age is in operation.

COUNTRY AND SUBURBAN CLASSES.

Out of an aggregate of about 800 classes for Technical Instruction in the State, with an enrolment of upwards of 18,000, there are 103 in the suburbs of Sydney and 435 in the country, with an enrolment respectively of 2,344 and 6,411. The classes connected with Public Schools not included in the above, number 125, with an enrolment of 2,415.

COUNTRY COOKERY CENTRES.

The extension of Cookery Classes into the country has been gradual. There is considerable demand for this form of instruction, and at the present time fully twenty centres are asking for teachers. Classes for technical students and the senior girls of our Public Schools are established on the group system. In a few towns the Technical Classes have not received the support which should have been given; the Public School Classes are generally well attended. The itinerant teacher of Cookery spent the latter portion of the year in establishing classes on the Northern Rivers. She is now engaged in similar duties at Cooma and Queanbeyan. Permanent teachers will be appointed to these districts when available. The latest centres formed are Armidale—Hillgrove and Glen Innes—Tenterfield—Emmaville. The Minister has recently approved of the following centres, and work has been commenced:—

Woonona—Bulli—Corrimal.

Tamworth—Manilla—Quirindi.

Singleton—Murrurundi—Muswellbrook.

Orange—Millthorpe—Blayney.

Forbes—Parkes—Molong.

The teachers in each of these centres have been trained in the Central School of Domestic Science.

Continuation Schools in Existence in New South Wales.

The Hurlstone Agricultural Continuation School, which was started less than two years ago, has proved a success beyond expectation.

The Goulburn Continuation School has been in operation but a few months. Its students are being trained for a life on the land, and the courses of instruction are accordingly in this direction.

The Newcastle Continuation School has just been inaugurated. The Syllabus provides for a liberal preparation to accord with local industries.

The Granville Continuation School, which has just received Ministerial approval, will serve a large industrial centre. The plans of the proposed New Technical College provide for commodious class-rooms and workshops.

The Technical Day School, established within the Central Technical College, is designed to prepare students for either the Engineering, Mining, or Architectural Courses in the College. It has started with an enrolment of over thirty, including holders of scholarships and bursars.

English is a compulsory subject in all the Continuation Schools, Mathematics and Science receive considerable attention, and Drawing and Manual Training in wood and iron have an important place in the time-tables of the Schools with an industrial tendency.

Brief Reference to Present Work and Conditions.

PROPAGANDA WORK.

DURING the year 1908 the Superintendent has lectured before the following bodies:—The New South Wales Engineering Association, on the "Relation of the Technical College to the Apprentice"; the Public School Teachers' Association, on the "Relation of the Technical College to the Teacher"; the Mayor and Aldermen and Members of Parliament, Redfern, and adjoining municipalities, on the "Need for the establishment of Industrial Trade Schools in all the industrial metropolitan and country centres"; the Balmain-Rozelle Institute, on "Industrial Trade Schools"; the residents of Tempe and Crow's Nest, on the "Question of Technical Classes in their Suburbs"; the Granville residents, on the "Question of Industrial Continuation Schools"; the Newcastle people, on "Industrial Continuation Schools"; and before the employers and employees engaged in the tanning industry at Botany, Willoughby, and Granville, on the "Advantages of a Central School of Leather Dressing."

In the country districts the following towns have been visited and classes either formed, or the necessary preliminaries taken towards their formation, or existing classes inspected:—Camden, Goulburn, Katoomba, Wyong, Tenterfield, Glen Innes, Inverell, Howell, Emmaville, Armidale, Tamworth, Newcastle, Helensburgh, Cooma, Bombala, Bega, Candelo, Pambula, Cobargo, Moruya, Milton, Nowra, Wollongong, Woonona, Corrimal, Bulli, Forbes, Parkes, Molong, Orange, Blayney, Millthorpe, Bathurst, Lithgow, Bowral, Dubbo, Gilgandra, Coonamble, Warren, Trangie, Narromine, Wellington.

In the towns where no Technical Classes had hitherto been established, the popular desire on the part of the town people was for Carpentry and Commercial Classes, Cookery and Dress-making, and Millinery. In a few towns Art Classes have been established. In pastoral and agricultural districts there is a great demand for practical scientific knowledge in regard to the common operations of farming, and in that most vital matter to farmers, viz., first-aid treatment in the ailments of farm animals. The appointment of two travelling qualified lecturers—one to make a tour through the farming districts to advise the farmer on modern methods of cultivation, and the other to instruct him how to deal with the common ailments of his horses and cattle, would be hailed with delight by the man on the land. The work of both comes legitimately within the scope of Technical Education.

A small effort has been made in this direction by sending out the College Lecturers in Agriculture during the holiday vacation. The response has been most satisfactory, and there is sufficient indication to warrant a much wider movement in this form of Technical Instruction

SCHOLARSHIPS AND BURSARIES.

An Advisory Council, consisting of the College Lecturers, has been appointed in the Sydney Technical College to confer with the Superintendent on matters affecting the welfare of the Institution, but not its general policy. One of the most important questions dealt with was that of Scholarships and Bursaries.

A scheme providing for the admission of pupils from schools in the most remote parts of the State, and for pupils in the various grades of Public Schools, including advanced pupils of the District and High Schools, to Technical Colleges and Schools, was approved by the Minister in the early part of the year. Examinations were held in June and December, but the response has not been great, owing, it is believed, to a want of knowledge on the part of the public as to the real significance of the movement. When fully availed of, the Scholarships and Bursaries will form an important link between the Primary Schools and the Technical Colleges.

Scholarships and Bursaries for students already attending Technical Colleges and Schools, giving admission to more advanced Technical Classes, were also instituted, and a most liberal provision made enabling students to prosecute their studies in subjects selected for their life's work.

The full text of the scheme is given in the latter half of the monograph.

For some years it has been under consideration to recognise the services of the long and valued members of the Staff. The Minister has recently given his approval to the following important recommendations:—

1. That the title of "Associate of the Sydney Technical College" be conferred upon any teacher or officer of the Technical Education Branch who has given twenty consecutive years' service in such capacity.
2. That the title of "Fellow of the Sydney Technical College" be conferred upon any lecturer in charge of any Department, or Resident Master, or a Superior Officer, who has held such position under the Technical Education Branch for at least twenty consecutive years.

EXAMINATIONS.

The system of term examinations recently introduced, at which the student's work, theoretical and practical, is judged by the Lecturers and Teachers, has been continued. The annual examination, now conducted in the main by outside examiners, was as usual held in the month of December, with the following results:—

Number of students examined	...	...	...	4,696
Number of passes	...	...	...	3,112
Percentage of passes	...	...	...	66.2

The value of the College Certificate is now generally recognised, but it is surprising what a large percentage of students, either through indifference or want of confidence, fail to present themselves at the annual examination. Attendance is purely voluntary on their part, and the only way towards getting an improvement in this respect is by direct appeal on the part of Lecturers and Teachers,



MAIN BUILDING, TECHNICAL COLLEGE, FROM THE NORTH-WEST—
FRONTAGE TO MARY ANN STREET.

DAY CLASSES.

The great bulk of the students attending the Sydney Technical College are enrolled in the Evening Classes. Nevertheless, there is a fair number of students attending Day Classes, the most important of which are:—

Agriculture	...	...	...	18	Ironfounding	...	...	...	...	13
Architectural Drawing	...	...	...	21	Mathematics	...	...	...	...	267
Art—Drawing, Painting, and Modelling	...	...	...	410	Metallurgy	...	...	...	...	13
Applied Mechanics	...	...	...	32	Patternmaking	...	...	...	...	13
Blacksmithing	...	...	...	22	Physics	...	...	...	...	114
Botany	...	...	...	13	Physiography	...	...	...	...	26
Carpentry	...	...	...	84	Plumbing	...	...	...	...	12
Cookery and Domestic Science	...	...	...	222	Sanitary Engineering	...	...	...	...	9
Chemistry, Practical	...	...	...	92	Wood Carving	...	...	...	...	45
Do Theoretical	...	...	...	82	Wool-sorting and Machine Experting	...	...	...	...	57
Dressmaking and Millinery	...	...	...	178	Wool Histology	...	...	...	...	25
Electrical Engineering	...	...	...	21						
English	...	...	...	31	Total enrolled	...	...	...	...	1,914
Fitting and Turning	...	...	...	99						

The number of individual students attending the Day Mechanical and Electrical Department is 44, and the newly established Technical Day School, 29. The enrolments for these sections are shown in the above statement.

PUBLIC SCHOOL TEACHERS' CLASSES.

Following the introduction of the modern syllabus, with its tendency towards specialisation, there came the necessity for special classes for Teachers. One of the first of these classes to be formed up in the College was that of Manual Training, embracing instruction from the Kindergarten stage through the intermediate course, and ending with Woodwork. The instruction in the earlier part of the course is given by a specialist in the Public School Service, and in the Woodwork by one of the College Teachers. A great impetus to the work is given by the sympathetic support extended to it by Senior Inspectors Parkinson and McLelland.

THE LANTERN AS AN AID TO TEACHING.

The lantern as a valuable aid to teaching is universally acknowledged. The College is well off in having some very valuable and superior lanterns, and has also a very fine bioscope. The Superintendent, in all his city, suburban, and close country engagements, has the benefit of these valuable aids, which are under the care of the College Lanternist and Operator—a gentleman whose work is of a superior character. His services are also freely given at the many lectures delivered under the auspices of the various Public School Teachers' Associations in the city. The College has a most valuable collection of lantern slides—Colonial, British, and foreign—which are fully appreciated by Public School Teachers in the city and in the country.

PRIZE LIST.

While the College cannot be credited with a single endowment, its prize list, though limited, is a meritorious one. A generous support in this regard is given by various trade associations, public bodies, city firms, and by individual citizens. This support is gratefully acknowledged in another part of this monograph. The prizes and medals presented are eagerly sought for by the students, providing as they do a healthy competition, an incentive to work, and an inducement to excel.

THE STUDENTS' SOCIETY.

It is not an easy matter, in an Institution like the Sydney Technical College, where the main body of the students attend Evening Classes, to organise much in the way of Sports. Up to the present, while one would be pleased to see a great Sports Union in the College, success has not as yet attended the efforts of those who know the value of well organised outdoor games.

If there has been little success in this direction, it stands to the credit of the College that it has a very popular Literary Society, with an enrolment of some hundreds of students. This valuable adjunct to the College has just passed through a most satisfactory year, not the least important of its work being the admirable course of winter lectures delivered by prominent citizens.



CORNER OF LIBRARY.

THE LIBRARY.

The Library contains nearly 6,000 volumes—largely technical and scientific—and also numerous journals and magazines. It is well patronised.

THE STAFF.

The Staff of the Technical Education Branch consists of the Superintendent, Assistant Superintendent, Registrar, seven Resident Masters, ten Lecturers, two hundred and fifty-seven Teachers, two Librarians. The Administrative Department numbers twelve Clerks and Messengers, three Modellers, three Carpenters, two Plumbers, three Operators, eight Caretakers, one Night-watchman.

The Staff of the Technological Museum consists of a Curator and Botanist, Assistant Curator and Chemist, Zoologist, Collector, two Clerks, two Carpenters, Printer, seven Attendants, Night-watchman. Total for the Branch, 328.

With but very few exceptions, the members of the Staff have performed their duties zealously, conscientiously, and intelligently.

Conclusions.

A large proportion of the students in the Industrial Workshops throughout the State, more particularly those whose studies aim at a knowledge of Mechanical Engineering, attend for the express purpose of mastering only a few subjects. These students are, in the majority of cases, apprentices, who devote their evenings to courses of Theoretical Instruction at the Technical College, in order to qualify themselves for the status and accompanying remuneration of journeymen. There has, on this account, grown up in association with the Central College (which should, theoretically, constitute the Charlottenburg of our Technical Education System in New South Wales) a very important class of youthful workers and students who take only a limited course supplementary to the practical application of their handicraft. In connection with this entirely unavoidable utilisation of the resources of our Central College, it has been rather captiously stated that the Institution undertook far too much elementary work, and far too little of the work of higher training in the more advanced branches of Technology. Some critics of the College have gone even so far as denunciation of the Institution as an educational entity, asserting that there were too many students in single-course subjects, and too few undergoing instructional training which would enable them to take their place in the great public life of the nation as "Captains of Industry." There is, of course, a certain amount of truth in this statement; but existing conditions at the Central College are capable of a very satisfactory, albeit not a very satisfying explanation.



GEORGE HOOPER, Assistant Superintendent.

Technical education in New South Wales is in its infancy. It is only in its initial stages of systematisation. It is a growth, not of prevision, but of expediency. Like our thoroughfares, which have followed mainly the tracks of the bullock drays of the early settlers, Technical Education in the metropolis has developed haphazardly with the unsophisticated development of the city itself. Under the necessary exigencies of the case, it has been centralised at the Ultimo Institute. Under the Board of Education and the Department of Public Instruction, encouragement has been given, for a period of thirty years and more, to youths attending

Evening Classes which dealt with the subjects which had a direct bearing upon the art, craft, trade, or calling they purposed following for the attainment of a livelihood. Outside the Central College no provision for this type of student was even as much as visionarily entertained. Moreover, until recently, the practice of admitting such students has never been questioned. It may be reasonably—indeed, unquestionably—conceded that the student of the class just referred to has no real place in a Technical College of the highest grade; but he has, hitherto, been deprived of all choice in the matter. His true seminary is a Continuation School, or a Trade School, but Continuation and Trade Schools in New South Wales are non-existent. Until Continuation, Trade, and Technical High Schools are created, the Technical College is, in all duty, bound to receive the student anxious to obtain such Technical Instruction as will better fit him for the calling he has selected as a means of earning a livelihood. We are to-day face to face with the problem of carrying forward the education of the child after the completion of the Elementary Day School course. It is a problem new to Australia, for we have permitted education as a practical science to take a very large measure of care of itself. In Great Britain (particularly in England and Scotland), on the Continent of Europe, in the United States, and in the great Dominion of Canada it is, however, being practically and determinedly considered. In Germany, more than in any other civilised country, the problem is dealt with in a manner as complete as it is efficient. In the first section of this monograph the legislation affecting compulsory attendance, particularly in Saxony and in Prussia, has been very fully detailed.

In England, a country which, unlike Germany, has no national system of education, special pains are taken by educational enthusiasts to ensure the obtaining of instruction by children who have finished the Elementary Day School course. M. E. Sadler (*vide* "Continuation Schools in England and Elsewhere") has a very interesting note on this subject in connection with the Evening Schools of Rochdale, a cotton and woollen manufacturing and engineering centre of about 85,000 inhabitants. In this town especial pains have been taken to encourage attendance at the Evening Schools, which are so arranged as to form a link between the Elementary Day Schools and the Technical School. The courses are scheduled in three grades and three sections, namely:—(1) Commercial; (2) Industrial; (3) and Domestic. The Elementary Industrial Course prepares for a more advanced scheme of tuition which is called the "First Year's Technical Course," and for Trade Classes which are held in the Central and Technical Schools. The Elementary Commercial Course is followed by Intermediate and Advanced Courses held in the Central School. The Secretary of the Education Committee (Mr. J. E. Holden) sends a copy of the following circular to every boy and girl leaving the Public Elementary School:—

"COUNTY BOROUGH OF ROCHDALE—EDUCATION COMMITTEE.

"The members of the above Committee very earnestly invite you, and all the scholars who have recently left the Day School, to *attend* an Evening School during the Session commencing Monday, September —, 19—,

"Your education only begins in the Day School. To be really valuable it must still be continued for several years.

" Your future position depends almost entirely upon it and upon the use you make of the next few years of your life.

" Education courses, which begin in the Evening Schools and end in the Technical School, have been arranged, and these courses aim at preparing students for positions in both workshops and offices.

" One of these courses will suit you, but it is essential that you should begin at once, before the knowledge gained in the Day School is lost. A few years' delay means that you may spend part of your manhood re-doing the work of your childhood.

" The accompanying prospectus supplies you with particulars of the Schools, the Teachers, and the Subjects taught, and any further information will readily be supplied either at the Evening Schools or at this Office.

" The fee must be paid in advance, either in one payment or by such weekly instalments as you may privately arrange with the Head Teacher.

" Scholarships and Prizes are offered for competition, and the students of all Schools are eligible to compete; by their means an efficient student should be able to secure a good education free of cost.

" J. E. HOLDEN,

" Secretary of the Committee."

" Education Office, Baillie-street, September, 19—."

Another circular is sent to the Superintendent of Sunday Schools, which in Rochdale, as elsewhere in Lancashire, play an important part in the educational life of the town. It is pointed out how important it is that young people who are free from Day School attendance and new to industrial life should be well employed in the evening. Sunday Schools retain most of these young people long after their names have been removed from the Day School Registers. The Education Committee, therefore, invite the co-operation of the Sunday School authorities in securing a good attendance at the Evening Schools.

The importance of similar Continuation Schools, and the necessity for their establishment in New South Wales in general, and particularly in Sydney, are matters which have already engaged the attention of the Superintendent of Technical Education, and several schools are now in existence which have for their object the preparation and direction of a knowledge of, and a training in, the art and science of Agriculture and in the Mechanical Trades. The beginnings in this departure are, however, on a somewhat restricted scale, and it is matter for astonishment that parents in general are but little interested in these schools, notwithstanding the fact that a liberal scheme of scholarships is set forth. Not only great ignorance, but absolute apathy is shown to this side of specialised education. Parents, indeed, require a continuous education in their own duties to their children, and in the significance and importance to the rising generation, the fathers and the mothers of the future, of Continuation, Trade, and Higher Technical Schools.

In co-ordination with Continuation Schools, Trade Schools should constitute part of a general scheme of Technical Education in every civilised community. In every suburb of the Metropolis, and in every considerable industrial centre, both types of such schools should be

established. In the chain of progressive industrial education next comes the Technical High School, an instructional institution which holds so high a place in seminarial esteem in the cities of Canada and the United States, but which has not yet been founded in this Australian Continent. Sydney must possess such academies, for they are so important and so essential to Secondary Education that their introduction cannot much longer be delayed.

These three types of Educational Institutions, when completely and efficiently established, should absorb the educative energies of a vast number of the youths who are now to be found pursuing their technical studies in the Workshops and the Class-rooms of the Central College. Indeed, their inauguration is the great question which confronts practical educationists in Australia, and there is none deserving more earnest consideration. At this point, however, there arises a difficulty. The foundation and extension of such schools would entail a considerable expenditure of money in buildings, equipment, and apparatus, and New South Wales has not yet possessed a Government prepared to vote sufficient funds to realise so magnificent a scheme, and no private philanthropist has yet arisen to emulate the educational munificence of many American and Canadian citizens in a similar direction in this country. In New Zealand, on the contrary, exists a most liberal system of scholarships which give admission into Technical Day Schools; South Australia has a well-attended Preparatory Seminary in connection with its School of Mines and Industry; and Melbourne, through the munificence of one of that city's public men, has recently added another Technical College to those already existing in the capital of the neighbouring State; but to the Sydney Technical College there has been not a single bequest or a timely donation. Throughout the civilised world America is known widely for the great private endowments of its citizens to Trades and other Technical Schools and Colleges. In England again, Manchester is a zealous centre in the cause of education; and in that highly progressive city has been formulated a comprehensive scheme of Technical Instruction, which embraces completely the varied needs of its population, and provides for the total complexity of interests in this great commercial and industrial plexus. As previously detailed in the first section of this monograph, Manchester arranges its work in Technical Education in three great divisions, namely:—(1) The Continuation School Grade, for students between the ages of 14 and 16 years; (2) the Lower Technical School, for those between 16 and 18; and (3) the Higher Grades of Technology for adults. In the year 1907, the enrolment in the first and secondary grades (which may be said to cover the period of adolescence) was 17,000. Such wonderful results, and such grandly successful organisation are quite intelligible when it is understood that the city of Manchester can draw on a working vote for educational purposes amounting to £800,000 per annum. The City of Sydney, and the other large centres of population in New South Wales, would soon be provided with Continuation Schools, and the complete scheme of Schools of Technical Instruction, if the Government of the State, or some wealthy private citizen, placed to the credit of the College £100,000 to carry out a similar educational programme. But until a sufficient amount is forthcoming, the best use must be made of the existing buildings, resources, and conditions.

Continuation Schools would, of course, necessitate compulsory attendance. Sadler points out that in the autumn of 1903 the Manchester Education Committee took steps to ascertain

what proportion of the students in the different Evening Schools of that city had joined the Evening Classes immediately after completing their course in the Elementary Day School. It proved that, out of 6,714 students present in the Evening Schools on November 16th, nearly one-half (48 per cent.) had allowed a gap of one or more years to intervene between the close of their Day School Course and the beginning of their attendance at Evening Classes. The Committee further asked the teachers in the Evening Schools to report whether they found that the students who entered the Evening Classes after such an interval had lost an appreciable amount of the knowledge which they had gained in the Day School. There was a striking consensus of opinion among the teachers that the loss was great. One teacher reported that, "Scholars who were in the Sixth Standard of the Day School are not able on returning to the Evening School after a year's absence, to do the work of Standard Third or Fourth." Another replied that he had "found among the adult pupils who had left the Day School many years before, men who, though they had been in Standards Fourth or Fifth in the Day School, had completely forgotten the methods of Simple Division." Another reported that "the work of a girl who allows twelve months to elapse before joining the Evening School, has greatly deteriorated, and it takes her a long time to regain what she has lost." Another said that "girls who had passed Standard Fifth or Sixth before leaving the Day Schools, are unable, after two or three years' absence, to do the work of Standards Third and Fourth, and are careless and inaccurate, especially in writing." The experience of the teachers in the Manchester Evening Schools is confirmed by that of teachers in other parts of England. And it must be remembered that only a small proportion of the children who go through the Day School Course ever come to the Evening School, even after an interval. Nor is the mere forgetting of much that they had learnt in the Day School the worst feature of the case. What matters much more is their loss of intellectual discipline and of the habit of regular learning during adolescence.

The history of education in England has been partly traversed by that of New South Wales. In the Motherland the first period extends from the rise of the modern Sunday School movement, about 1780, to the first Parliamentary vote "for the purposes of education," in 1833. It covers the chief phases of the Industrial Revolution and the struggle for political reform. The main influences which were at work in "Further Education" at this period were religious and political. The religious revival of the Eighteenth Century, expressing itself in the Wesleyan, the Evangelical, and other movements, led many men and women to devote themselves to the task of relieving the spiritual wants of the poor, and of teaching them to read, in order that they might study the Bible. The political movement produced a strong desire for the intellectual enlightenment of the masses. It ran in two main currents. One was individualist and radical, the other collectivist and authoritarian. On the educational side of the first the chief names are those of Jeremy Bentham, Brougham, and Francis Place. On the educational side of the second, the great figure is Robert Owen. Both groups drew part of their inspiration from France. The individualist group was greatly influenced through Adam Smith's "Wealth of Nations" (which strongly urged the wisdom of giving the Elementary Education to the whole people), by Turgot and the Physiocrats. The other group, and especially Robert Owen, drew their educational ideas, in great measure, from Helvetius. Apart from the work of these two

groups there was great educational activity on the part of earnest Nonconformists (notably William Allen and other members of the Society of Friends) and, on a larger scale, on the part of the Church of England. The educational labours of the latter call for special recognition. Though partly of a self-protective nature, they drew their real power from religious conviction and benevolent regard for the poor. These various movements though divergent in many of their principles, were at one in providing means of Elementary Education for the poorer classes. Through the lack of Day Schools, and the long hours of child labour, much of the instruction thus provided was given in the evening. In this connection, M. E. Sadler, writes:—

“Night Schools first received pecuniary aid from the Government in 1851. But from the first beginnings from what is now the Board of Education’s work, the Government Inspectors watched their progress in different parts of the country. The Committee of Council on Education was established in 1839, and in the Department’s first report (1839–40) Mr. Tremenheere, in his report on the state of Elementary Education in the mining district of South Wales, stated that the number of adults attending Evening Schools was about ninety. In the mining districts of Durham and Northumberland, Mr. John Allen found (1840) that almost all the ‘Common Day Schools’ conducted by masters for private profit, and attended by boys and girls, were also opened during the winter between the hours of seven and nine ‘for the instruction of pitmen and others not able to attend during the day.’ Mr. Allen adds ‘that the owners of collieries are, in most cases, willing to provide their labourers with a room which may be used as a Day and Night School during the week, and on Sunday is opened to one or two sects, and in some instances three, in succession, for the purposes of public worship.’ The Rev. Baptist Noel reported in 1840, evidently quoting in part from the reports of the Manchester Statistical Society, the following attendance at Evening Schools in five large towns:—Birmingham (1838), 563; Manchester (1834), 1,458; Liverpool (1836), 548; Salford (1835), 526; and Bury (1835), 151. He speaks of Evening Schools as useful to young persons whose early education has been neglected, and who want to learn the three ‘R’s,’ but adds that ‘the Evening School which only affords instruction for four hours in the week, and that when the scholars are jaded with twelve or thirteen hours of toil, cannot educate those who attend it.’”

In 1844 the Rev. F. C. Cook reports that Mr. Geary, a manufacturer in Norwich, “allows no youth to attend his factory who is unable to read, *and compels their attendance at an Evening School until they arrive at years of maturity.*” It is a great pity that the employers of youthful labour in New South Wales have not a similarly keen sense of individual responsibility in this connection. But we must not neglect a mention of a fine educational agency in our midst which owed its initiation to the efforts of Sir George Williams, and which, in Sydney, has a warm friend and consistent patron in Sir James Fairfax of the *Sydney Morning Herald*, namely, the Young Men’s Christian Association. The American branch of this great Society (founded in 1851) has developed educational classes for both General and Technical Education much more extensively than, with few exceptions, has been the case in the United Kingdom. Mr. Hodder Williams writes:—

"It may be predicted with confidence that future years will find the educational work of the Association organised and maintained with greater efficiency than at present. It is true that at the time of writing, this department is lacking in signs of immediate growth. This is largely owing to the fact that members have been discouraged by seeing the educational work of the Association in Great Britain brought into competition with the Evening Classes established by the Educational authorities. There are, however, not wanting signs that the Association is beginning to realise that a wide field is open to-day for the provision of specialised forms of instruction designed to fit journeymen for the profession or business in which they are engaged. That there are great possibilities of successful work in this direction has been demonstrated in recent years by the Central Association, which, by making provision for the training of young men for the Civil Service, and preparing candidates for the examinations of the Bankers' Institute, and of the London Chamber of Commerce, has secured for this Department a degree of prosperity far exceeding that obtained when the curriculum was confined to ordinary commercial subjects."

It is only just that this acknowledgment should be made to a very great Association, the influence of which in Sydney has unvaryingly been for the good of the youth of the city. In America a further development of the work of the Y.M.C.A. has been the establishment of boys' sections in connection with some of the larger branches. These endeavour to meet the special needs of boys between the ages of thirteen and seventeen years.

There is little doubt, as Sadler eloquently points out, that Evening Classes, and other forms of popular adult education in England, have encouraged the habit, and have helped in training the power of voluntary organisation—a stimulus woefully lacking in Australia and especially lacking in New South Wales, save in a few isolated cases. For fifty years the Evening Schools in England were, without exception, independent of subsidy from the State; and to this day the majority of them receive no aid from public funds. By the help of Evening Classes in the Old Country thousands of vigorous minds have repaired the defects due to the lack of early training. The work done in such institutions has steadied the judgment and kindled the imagination of many who have afterwards become leaders of opinion in their district or trade. Such classes have trained some of the leaders of the industrial and commercial movement, which gave Britain a leading place in the markets of the world. They were the chief channels through which a knowledge of physical science was diffused among the industrial classes. In England, in Scotland, and in Wales, they have had their characteristic, and often separate, development. But each branch of the movement has in turn exerted decisive influence upon the others. Thus, the varied means of "Further Education" for the people have rendered signal service to the intellectual, moral, and economic interests of the whole of the United Kingdom.

But, on the other hand, as Sadler is careful to point out, these Evening Classes have been in some respects little else but a makeshift for what should have been done in Elementary Day Schools. In England, conflicting (though dimly formulated) social ideals long prevented a comprehensive organisation of public education by means of the authority of the State. Much

that was attempted in Evening Schools would, Sadler shrewdly insists, have been better done by a *well-planned system of Day Schools, or by Day Classes, dovetailed into the practical duties of apprenticeship*. Through the lack of a sound foundation of Elementary Knowledge in the minds of many of the pupils, the work of the Evening Classes has often been wanting in thoroughness of intellectual discipline. Their efficiency has suffered from insufficient funds. *Not having behind them the pressure of legal compulsion*, or such steady force of public opinion as renders legal compulsion unnecessary, they have left untouched large sections of the community, some of which especially need long-sustained and well-directed care. They have offered excellent opportunities to those with enough force of character and physical vigour to fight their way through difficulties to positions of responsibility or of leadership. But they have in great measure failed to touch the less strenuous or the idle. Thus alike in their excellence and in their defects, the Evening Classes have borne the characteristic features of English Educational organisation. Free in their development, vigorous in some of their achievements, and often well adapted to the requirements of the persevering and the strong, they have been unsystematic in arrangement, weakened by defects in the early training of their pupils, and, from a national point of view, insufficiently adjusted to the needs of the rank and file, especially during the critical years which lie between boyhood and manhood. How different is the German method, with its keen distrust of individual effort and its insistence upon system! Sadler becomes enthusiastic in his commendation of the compulsory methods of the Teuton. He writes:—

“The German Empire comprises twenty-five States and the Reichsland of Alsace-Lorraine. In twenty-one out of these twenty-six constituent parts of the Empire, attendance at Continuation Schools is now compulsory for the whole or part of the younger population during a period of time (which varies in length in different districts) immediately following the conclusion of the Elementary Day School Course. The five States in which attendance at Continuation Schools still remains wholly voluntary contain only one forty-sixth part of the population of the Empire. Broadly speaking, Germany has within the last thirty years declared herself decisively in favour of extending the educational care of the community over the individual during the critical years of adolescence. The idea of collective responsibility for individual welfare has grown in power. Step by step the authority of the State has advanced. The principle of compulsion has been pushed beyond the somewhat narrow limits of the Elementary School (6–14) into the period of adolescence, during which (as is justly contended) there is no less need of educational direction and care. In bringing about this extension of the compulsory principle economic interests have combined with moral consideration. The view that Technical Training, following upon a good General Education, has become indispensable to the industrial and commercial success of a nation commands the unreserved assent of the German people. In no other country is this principle more consistently applied. And, therefore, as soon as it was realised that modern conditions of Industry and Commerce threatened to deprive young people of the educational care which was formerly provided through apprenticeship, the idea of compulsory attendance at suitable Continuation Schools rapidly grew in favour among the workpeople, and, though more

slowly, among the mass of employers also. But it was not to economic interests alone that the growth of this opinion was due. Moral considerations support it. Fears were felt that the moral welfare of the nation would suffer if no measures were taken to counteract the deteriorating influences of town and city life during the first years of a youth's freedom from the discipline of Day School life. The idea of extending the principle of compulsion was not uncongenial to the habit of mind induced by familiarity with the enforcement of discipline by the State, through compulsory military service. Nor was there practical difficulty in enabling the local educational authorities to keep themselves informed of the whereabouts of all the young people who had already passed through the Elementary Schools. For reasons of military organisation, the administrative machinery necessary for the supervision of every male adult member of the community was ready to hand; and obedience to Constituted Authority was habitual in all classes. The foundation of the system lies in the fact that in Germany the individual citizen is made to feel in a way unknown in England his personal duty towards the organised State."

Sadler points out that it is quite admitted that there is a bad as well as a good side to this form of national organisation, and that such is admitted even by those who heartily endorse the German system. But the latter, nevertheless, contend that discipline enforced by authority is necessary to the strength and perhaps to the existence of the nation. And it is further argued that within the framework of sternly-enforced national organisation there is secured for the individual a measure of economic and moral freedom which is denied to many of the victims of competition in a more individualistic society. In any case, the observer can but record the fact that the principle of compulsory attendance at Continuation Schools, which is but the logical development of compulsory attendance at the Elementary School, meets with the approval of the great majority of the German people.

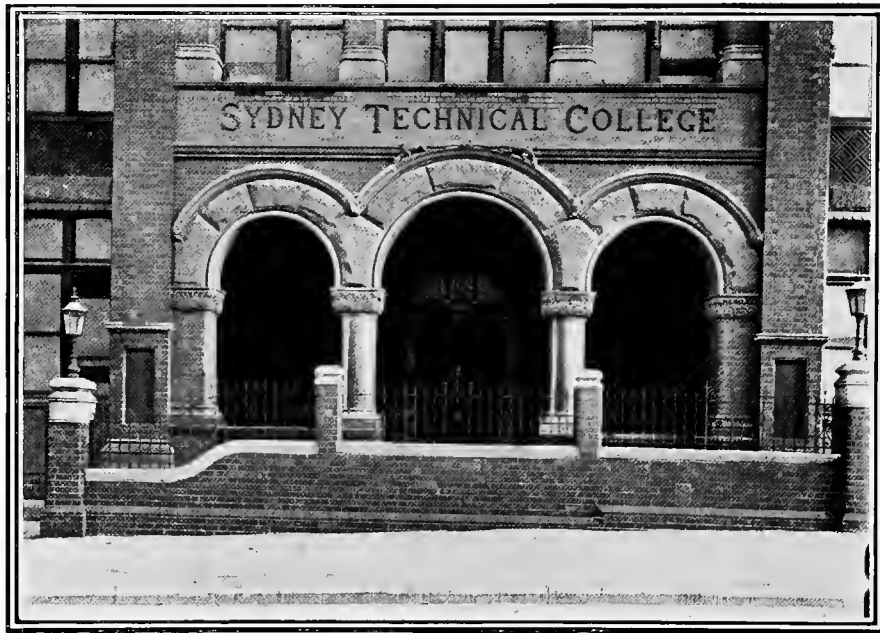
The work of Continuation Schools for boys is increasingly of a Technical Character, and bears directly upon the industrial occupations of the pupils. By the Imperial Industrial Law of June 1st, 1891 (as amended, June 30th, 1900), *employers of labour are obliged to grant to their apprentices and other workers (including all male persons, and female clerks and female apprentices) who are under 18 years of age the necessary time for such attendance at Continuation Classes as required by the local authority of the district.*

The arrangement of Continuation Classes in the day-time is rapidly becoming general where the exigencies of the trade allow. The Decree of the Minister of Industry and Commerce (of August 20th, 1904) sternly discourages Continuation Classes on Sunday, and the practice of requiring attendance at any time after 8 p.m. on a week-day. Classes are only permitted on Sundays (when allowed at all on that day) at hours which do not interfere with attendance at Divine Service.

The movement for compulsory attendance at Continuation Schools is by no means exclusively confined to the towns. But, as might be expected, it is in industrial and commercial centres that the recent developments have been most striking. The organisation of Continuation Schools effected in the city of Munich by Stadtschulrat Dr. Georg Kerschensteiner (whose writings

on the subject have had widespread influence in Germany and elsewhere) calls for special mention, as combining in an exceptionally high degree care for artistic and Technical Training, with regard for liberal culture and for the duties of citizenship.

The question of compulsory attendance is one which Australia will be compelled to face, and this monograph may have occasion to revert to it in as far as it affects the industrial conditions of our own State. Already Great Britain is following Germany's lead. The London County Council the other day originated a Bill making School attendance compulsory in the Elementary or Primary General Schools up to the age of 15 (an advance of one year on the old requirement); and half-time attendance up to the age of 18 in a Continuation School. For the sake of the large future which the children of Australia will be called upon to exploit, it may be quite imperative for us also to initiate a similar educational system.



MAIN ENTRANCE TO COLLEGE.

Part IV.—The Future View of Technical Education in New South Wales.

THE future greatness of Australia is a fact beyond question. The youngest of all the settled lands of the earth, it is also geologically the oldest. It was fortunate in these particulars, inasmuch as seismic convulsion had spent itself in this Great Southern Land millennial ages before the last glacial epoch passed away to make room for the Old Stone Age in Europe; and it was kept inviolate through all the ages untrodden by the foot of man save by some wretched Dravidian wanderers from the Indian Dekkan, who brought with them the boomerang and their tribal rites, but no civilisation worthy the name. Unwarlike and uncultured, their conquest was simple and bloodless. Hence, occupation by a highly civilised white Aryan race was accomplished at an opportune moment on what was practically a virgin soil. The entrance of Australia into the realm of history was coeval also with Great Britain's complete empire of the sea, at a time when steam and machinery were in the very matrix of an epoch-making birth, when the world was passing through a momentous stage of transition into modern being, and the conditions of our present civilisation were fluctuant and formative.

An inspired finger seems to have directed the newcomers to an ideal port of anchorage—that Harbour of Port Jackson, which ranks with Naples and with Rio in beauty, but above them in utility, and which Phillip declared to be the finest in the world. The future of Sydney is one of inevitable greatness. Fate has decided that question by virtue of Sydney's absolutely perfect position. There is no modern city in the world similarly planted for illimitable development along the commanding heights of a hundred coves and landlocked arms of the extrusive waters. Whatever the future political status of Sydney may be Time alone can determine; but the magnitude and splendour of its commercial and industrial future need not be even momentarily questioned. If not the Rome, it may be the Athens of a coming mighty Southern Empire, great in Science, Philosophy, Art and the Beauty of Life, as well as supreme in the agencies of production and distribution throughout our Pacific Hemisphere. That it is destined to Antipodean supereminence as the London, the New York, the Glasgow, or the Manchester of a distant day, the Woolwich, the Pittsburg, the Essen, or Le Creusot of a new era, appears to be as certain as the decrees of Fate itself. Sydney may achieve the proud position of being also the Paris or the Vienna of the pleasure-makers and beauty-worshippers of generations yet unborn. There is certainly no Australian city more advantageously situated. The dawning glories of our Commonwealth, our State, and our State's splendid metropolis, can only faintly be visioned to the imaginative eye of the enthusiastic patriot, but inadequate though that previsioning may be, it is nevertheless sufficient for a partial forecast of the growing day. We know by personal experience and by actual observation something of the natural condition of countries both in the Old World and the New, and that experience and that observation

has been illuminated by the searchlight of history; and we can arrive at a conclusion no other than that our land and its future are a goodly heritage. In the eloquent words of John Farrell a poet who nobly voiced the aspirations of this young Commonwealth:—

O Radiant Land ! o'er whom the Sun's first dawning
Fell brightest when God said " Let there be Light " ;
O'er whom the day hung out its bluest awning
Whitening to wondrous deeps of stars by night—
O Land exultant ! on whose brow reposes
A queenlier coronal than has been wrought
From light of pearls and bloom of Eastern roses
In all the workshops of high Poet-thought !—
O thou who hast, thy splendid hair entwining,
A toil-won wreath where are no blood-splashed bays,
Who standest in a stainless vestment shining
Before the eyes and lips of love and praise—
O wrought of old in Orient clime and sunny,
With all His richest bounties graced and decked ;
Thy heart all virgin gold, thy breath all honey,
Supremest work of greatest Architect !—
O Land of widest hope, of promise boundless,
Why wert thou hidden in a dark, strange sea
To wait through ages, fruitless, scentless, soundless,
Till from thy slumber men should waken thee?—
Why did'st thou lie, with ear that never hearkened
The sounds without, the cries of strife and play,
Like some sweet child within a chamber darkened
Left sleeping far into a troubled day?—
What opiate sealed thine eyes while all the others
Grew tired and faint in East and West and North ;
Why did'st thou dream until thy joyful brothers
Found where thou wast, and led thee smiling forth?—
Why did'st thou mask the happy face thou wearest?
Why wert thou veiled from all the eager eyes?
Why left so long, O first of lands and fairest,
Beneath the tent of unconjectured skies?
We know thy secret. In the awful ages
When there was silence and the world was white,
Ere yet on the recording volume's pages
The stern-browed Angel had begun to write ;
Ere yet from Eden the sad feet had wandered
Or yet was sin or any spilth of blood,
August in judgment, God the Father pondered
Upon His work, and saw that it was good—

The Sovereign of suns and stars, the thunder
 Of whose dread Power we cannot understand,
 Sate throned and musing on the shining wonder
 Of this new world within His hollowed hand,
 With high sad eyes, like one that saw a vision—
 And spake “Lo ! this My gift is fair to see,
 But Pride will mar the glory, and derision
 Of many feet that will not follow Me.

“ I give my creatures shields of hope and warning ;
 I set in fruitful ways of peace their first ;
 But even these will turn from Me, and scorning
 My counsel, hearken to the Voice Accurst ;
 And sin, and pain, and death will make invasion
 Of this abode, and from a world undone
 To Heaven will sound the moans of expiation
 They wring from Him, My well-beloved Son.

“ And yet again will they, with eyes unheeding
 His sacrifice, uplift their guilty hands
 Against their brethren, and with rage exceeding
 And lust, and vengeance, desolate the lands.
 But this one land,” so mused He, the Creator,
 “ This will I bless and hide from all the woe,
 That worthier among men, in ages later
 May find it pure, and, haply, hold it so.”

Then, sweet Australia, fell a benediction
 Of sleep upon thee, where no wandering breath ;
 Might come to tell thee of the loud affliction
 Of cursing tongues and clamouring hosts of death ;
 And with the peace of His great love around thee,
 And rest that clashing ages could not break,
 Strong-sighted eyes of English seekers found thee,
 Strong English voices cried to thee “ Awake ! ”

For them a continent undreamed of, peerless,
 A realm for happier sons of theirs to be,
 One land preserved unspotted, bloodless, tearless,
 Beyond the rim of an enchanted sea,
 Lay folded in the soft, compelling languor
 Of warm south airs, like an awaiting bride,
 While strife, and hate, and culminating anger
 Raged through the far-off nations battle-dyed.

Here were no dreadful vestiges imprinted
With evil messages and brands of Cain,
No mounds of death or walls of refuge dinted
With signs that Christ had lived and died in vain;
No chill memorials here proclaimed the story
Of kingships stricken for and murders done;
Here was a marvel and a separate glory,
One land whose history had not begun !
One unsown garden, fenced by sea-crag's sterile,
Whose iron breasts flung back the thundering waves,
From all the years of fierce unrest and peril,
And slaves, and lords, and broken blades, and graves;
One gracious freehold for the free, where only
Soft dusky feet fell, reaching not thy sleep;
One field inviolate, untroubled, lonely,
Across the dread of the uncharted deep !
O dear and fair ! awakened from thy sleeping
So late ! The world is breaking into noon ;
The eyes that all the morn were dim with weeping
Smile through the tears that will cease dropping soon !
Thine have no tears in them for olden sorrow,
Thou hast no heart-ache for a ruined past ;
From bright to-day to many a bright to-morrow
Shall be thy way, O first of lands and last !

There can be no wonder that the poet felt a fine and glowing enthusiasm for his country, and that the patriot in his nature throbbed with a splendid pride, for few of Sydney's publicists were better informed or more widely experienced in the resources of Australia, and particularly those of New South Wales, than John Farrell. He knew, as we all know, that the natural, and practically unexploited, wealth of our own State alone is something truly marvellous, that our climate is without a peer in the latitudes of the Northern Hemisphere, that our death-rate is the lowest known to the world's statisticians, that robust health and long life are the guerdon of the poorest of our citizens, and that we have all the requisites physical, climatic, productive, and geological for the mental, moral, and physiological culture of a race of virile intellectual athletes—in short, the Australians have an opportunity, such as given to no other nation among earth's children, of realising the grand Greek ideal of the perfect mind in the perfect body. A great factor in the possible attainment of this ideal is to be found in the determination of the people, the democracy, to keep the Australian race pure and undefiled—British mainly, but, at any rate, white Caucasian of the highest type. This very question of racial purity is one of the responsibilities involved in the vastness and value of our great destiny, and the spacious future we may reasonably expect from the largeness of our splendid heritage, which imposes upon us other and equally onerous responsibilities, the foremost and most outstanding among them being the education of our children and of our skilled workers.

We have awakened to the vital necessity of a sound system of Primary Education only within the past few years—an awakening which has happily resulted in a complete reorganisation of the outworn and obsolete methods of instruction which obtained in a former day. To this reorganised system, a large sum of money, approaching to nearly a million pounds sterling per annum, is devoted; but with Primary Education the financial support of the State may be said practically to cease, this munificent expenditure leaving the pupil at a stage in his instructional progress, at which, in the other countries of the world, his real seminarial course is considered to be only beginning; for elsewhere the Elementary School is properly and necessarily recognised as totally inefficient in the preparation of the youth for his or her selected life calling.

It has been sufficiently shown, and reiterated, in former portions of this monograph that such Old-World countries as Great Britain, France, Germany, Switzerland (and even reactionary Russia); and such New World nations as the North American Federated United States and the Dominion of Canada (the newly-born modern power of Asiatic Japan must not be forgotten); together with various other European peoples in the van of civilised human progress hold as an article of educational faith the vital tenet that the age of 14 or 15 years is the starting point for a seminarial course intended to fit the youthful student to take his or her place as a national asset in the spacious arena which makes for national greatness and national efficiency in commerce, in industry, and in every type of national achievement. Moreover, there is no country in the world with any pretension to even the most imperfectly advanced form of civilisation (Portugal, to wit), which does not essay in some fashion to create a method, however faulty, of continuing the work of the education of their children through the adolescent period to within an appreciable approach to maturity.

The magnitude of the expenditure upon Secondary Education in countries oversea and far distant from Australia may be relatively gauged when it is stated that the Municipal Authorities in the city of Manchester, England, have at their disposal for purposes of Technical Instruction a grant of £800,000 per annum. It must, moreover, be remembered, in this connection, that Manchester is a city containing a population not very much greater than that of Sydney. American munificence and German liberality in the cause of Education (Elementary, Continuation, Trade, Technical, and University) need not here be insisted upon, as these subjects have been dealt with in preceding pages of this monograph.

The Government vote for purposes of Technical Education in New South Wales during the past four years is shown in the following tabulated return:—

Year.	Amount.
1905-6	£35,008
1906-7	£34,820
1907-8	£43,952
1908-9	£44,876

Our accomplishment in the past and our activity in the present constitute the merest bagatelle, when we compare either our achievement or our efforts with those put forth by cities, the wide-world over, which cannot even appreciably compare with our noble State Capital in population or in area. The small annual amount of our expenditure on Technical Education

proves conclusively that, as a nation, we have not yet awakened to the large national significance of Specialised Instruction. It is certainly a fact that there is in New South Wales an attendance roll of over 18,000 students for the present year; it is no less a fact that the fees received have amounted to upwards of £14,000; and that there is, moreover, ample evidence that the instructional classes are both popular and properly appreciated; but neither has the Sydney Technical College nor Technical Education in the State of New South Wales, reached its zenith of adaptative utility in the one case, nor its possible and desirable high level in the other. An intelligent observer of educational development in other countries could not possibly conceive a British, or an American, or a German city, with a population on the progressive high-road towards 600,000 inhabitants, containing no State Commercial School, no Technical High School, and with but one or two Continuation and Trade Schools. Yet such is the woful condition of the Capital of New South Wales educationally.

Of course, it must not be inferred that the State Government is altogether responsible for this condition of the seminarial system. In America private munificence in the cause of Education is a proudly national proverb. In Great Britain the Municipal Corporations and the great industrial firms are consistent and strenuous supporters of the system of Technical Instruction which forwards national greatness. In Germany, in Switzerland, and in many of the countries of Europe (including even tiny Finland) the State endowment is aided and reinforced by the Departmental Local Government, by Municipal Corporations, by Trade Guilds, by Merchants' Associations, by Workmen's Lodges, by private sympathisers, and even by religious bodies concerned in the future welfare of the youth of both sexes trained primarily in their Denominational Day and Sunday Schools. The cause of Education in Australia, in New South Wales, has not been systematically supported and upheld, mainly because it has been inchoate, nebular, amorphous. There has always been a large and perfectly sincere sympathy with the national objective which all genuine Education must pursue to be nationally valuable; but with an ineffective Primary system, and a highly advanced University system based on conceptions of culture current in the Mediæval Ages, absolutely separated from Elementary Instruction by an unbridgeable gulf, aid of any kind, even from the most educationally enthusiastic and philanthropic, has been sporadic and, by the very nature of the conditions, is incapable of direction of any effective kind, and little good in any large sense has hitherto been achieved. The monograph cannot, and does not, undervalue the good accomplished in the past by men of the calibre of the late Mr. Challis, or the living Mr. Hugh Dixson. Mr. Peter Nicol Russell has been a great benefactor to the cause of Higher Technical Education. Sir George Grey, by his splendid donations of anthropological, ethnological, and other collections, to the Museum of Wellington (New Zealand), Adelaide (South Australia), and Cape Town (South Africa) showed himself, indeed, worthy of the title of the "Great Proconsul." Mr. Thomas Fisher should be held in reverence by the students of the Sydney University for all time. This monograph does not arraign these noble-minded benefactors to the cause of Higher Education. It is recognised that it is the duty of Educationists to formulate a proper scheme of Secondary Education before private munificence can be authoritatively called upon to give it efficient support. Nevertheless, it is the hope of the Superintendent that, having, in this publication, detailed the Secondary

Educational requirements of the community, efforts of a privately directed nature will not wander into by-paths and blind alleys of ineffectiveness and partial abortion. The University is not now in a parlous state of unendowed educational starvation. Hitherto, University Education, most particularly availed of by the children of the highly-placed and the wealthy, has received more than its fair share of privately-directed munificent aid, while Secondary Education, which is a pressing national and popular necessity, has received absolutely nothing at all from the benevolent impulses of those best able to help it forward in the vital interests of their State.

So far Technical Education has been compelled to rely solely on State assistance, and the small annual grant for the providing of new buildings, and the allowance for the expansion of Technical Instruction (reduced, by the way, to the extent of £4,000 for the current year) is sufficient for only the most rigidly conservative needs and the most pressing of unforeseen exigencies. This is, in all conscience, serious enough, but a still more serious aspect of affairs is shown in the fact that when the building additions at present in contemplation are effected, the Technical College site will be too densely occupied to accommodate another single brick. If Technical Education in New South Wales is not to be allowed to stagnate, one course is open—and one course only—namely, a large sum of money must be obtained (by concerted action, if possible, State, Municipal, Associative, and Private) in order to effect all the imperatively needed improvements and adequate equipment, and to make ample and necessary provision for inevitable and expected development. The policy of patchwork and makeshift and *laissez faire* has had its day. To attempt its continuance at this stage would be suicidal. It has long enough held a self-stultifying and self-destructive course, and national efficiency demands its abolition at once and for all future time. From the point of view of the City's interest, additional land is imperatively essential, and until such land is obtained very little further development in the work of the College can take place. Adjoining the grounds of the Central Institution is a large block of land, suitable in every particular for the construction of all the buildings requisite for the accommodation of the augmenting classes for years to come; and this land, highly valuable from an Educational view, is lying idle.

The class-rooms, workshops, studios, laboratories, lecture-halls, &c., in the existing Institution, have now become too small for the work of Technical Education, although every room in the College is occupied each night in the week, and hundreds of our youths (apprentices and others, who are obliged by Legislative Enactment to attend, and who are, on their own account, anxious to do so) are denied admission because teaching space is so limited that their reasonable accommodation is a matter impossible. It is very patent, therefore, to all who have the power to think, and the leisure to do so, that some practical remedy for this state of things should be devised. The students are waiting; but not alone the State—the Municipality, the Trades Combination, and the Private citizen must be energised into assistance, and the untoward position efficiently adjusted.

The Superintendent anticipated the purchase of this adjoining land, which is so clamantly needed for the expanding activities of the Central Technical College. He had, therefore, plans and specifications prepared, adapted to the construction and equipment of Science Class Rooms

Laboratories, Workshops, Studios, Offices, &c., of the most modern character and designed with a view of meeting all future requirements. These plans and specifications were based on those very generously placed at the disposal of the Superintendent by the Managements of such Institutions as the Sheffield University and the Manchester School of Technology, England, both acknowledged to be very modern in their scientific equipment, and to possess the latest appliances in all forms of Technical Education. The existing provisions for Scientific Instruction in the Sydney Technical College are of the most obsolete type. This statement does not, of course, refer to the teaching or to the Staff, but to the buildings, and in some respects to their equipment. Very different accommodation is, indeed, wanted for the Instructional Classes in Chemistry, Electricity, Physics, Agriculture, &c., than that which is at present provided; and this should be one of the first things to engage the attention and the energies of our Educational Authorities.

In this connection it may be mentioned that a new building has just been completed by the simple device of erecting a storey over the Foundry, in order to accommodate the students engaged in the Course for Mechanical Engineering. This addition is now fully occupied, and its accommodation is taxed to the uttermost; nevertheless, there are a number of students waiting to take up this Course, and for them there is no room. The Printing Workshop, which is a wooden structure, has, moreover, been condemned by the Superintendent of the Fire Brigades, as being a source of danger to the College. Provision can, of course, be made for the teaching of some of the Science subjects by the erection of additional storeys over existing structures; but such could, at best, be of only temporary usefulness; hence the inevitable necessity of acquiring unoccupied land upon which to construct large and permanent buildings.

In a preceding paragraph stress has been laid on the growing prosperity, the present importance, and the future greatness of the city of Sydney; yet we are, nevertheless, confronted with the somewhat humiliating fact that Australia's foremost Commercial Metropolis possesses no State Commercial School. This is to be all the more deprecated because the Technical College can supply nearly all that is necessary by way of a Teaching Staff. Moreover, that valuable storehouse of commercial products and processes, and inestimable auxiliary of Applied Specialised Instruction, the Technological Museum, is fully equipped for the furnishing of the apparatus and specimens necessary for the study of the practical side of the subjects embraced in a Commercial Course. There is, however, no building in which to house the students, consequently whatever is being done in the way of Higher Commercial Education is, as far as the State is concerned, of the most desultory and ineffective character.

It is a matter for candid admission that there is far too great a proportion of the students in attendance at the Technical College, who are engaged in Elementary Subjects, revising the *lacunæ* of the Primary School Course. Many of these young people would be much better occupied in attendance at Continuation and Trade Schools, thus relieving the pressure on the resources of the College, and giving the Institution an opportunity of entering upon its legitimate and essential Technical Curricula. In succession to the Continuation and Trade Schools, there should be provided also an Educational Institute with even more extended courses, namely, the Technical High School. All these instructional establishments should find their proper

and imperatively needed place in the Educational System of the State, with special attention to the clamant requirements of the Metropolis, and their foundation cannot, with national safety as regards commercial and industrial efficiency, be much longer delayed.

Moreover, the Head Masters of the large Public Schools in Sydney, and in the chief centres of population in other parts of the State, are vitally interested in the foundation of Continuation Schools, and the pupils themselves may be accepted as fairly accurate judges of the education they require in arming themselves for the battle of life. A Head Master of a Public School, a teacher whose whole educating experience has been on the side of the practical, told the Superintendent of Technical Education, in the course of a conversation, that he recently gave as a task to his Senior Boys (some hundreds in number), the writing of an essay on the calling which each individual pupil intended to follow up as a means of obtaining a livelihood. With only two exceptions these lads chose either an industrial occupation or a life-calling associated with the soil. In the case of the two boys excepted, each of them selected commerce; and, appropriately enough, they were Jewish lads. This statement is not made in a spirit reflecting upon the choice of these two young Jews, but as indicative of a long-instilled business bias, for they were only evidencing the natural instincts of their race. The foregoing incident is eloquent as showing the trend of preference relative to a life-calling in the rising generation of our male youth.

The most needed Educational extension in the country districts of our State lies in the direction of simple and practical teaching in Agricultural Science for the more efficient equipment of the farmer, and some instruction in Veterinary Surgery, and similar knowledge, pertaining particularly to the maintenance of health among the live-stock, and the treatment of animals in sickness and disease. In this connection the views of the Hon. Horace Plunkett are singularly appropriate and worthy of the deepest consideration: and it would undoubtedly reimburse the State a hundredfold were it to employ a couple of qualified instructors as itinerant lecturers to take up such Educational Courses as those just indicated as their especial duties. An indication of the value of this form of instruction, and a proof of its highly popular appreciation, are to be found in the great success which has attended the Classes conducted in the pastoral centres of the country for the imparting of instruction in the tending and feeding, general treatment, classing and judging of sheep; and the sorting, classification, preparation, valuation, and scouring of wool, &c.; and the future should witness an almost illimitable development in this direction, concerning as it does, our great staple and paramount industry in this Land of the Golden Fleece.

Writing with especial reference to the value of itinerant instruction, the Hon. Horace Plunkett, Vice-President of the Department of Agriculture and Technical Instruction for Ireland, says:—

“ We hope eventually to see established as part of the educational machinery of every county in Ireland an Itinerant Agricultural Instructor, whose services shall be given exclusively and permanently to the particular county, to the Council of which he is attached. If there is one feature of agricultural education which, having been tested to

the utmost in every country of the world, has stood that test better than any other, it is the itinerant instructor. In our researches at the time of the Recess Committee this was a feature which in every country the administrator and the educationist laid stress upon, as showing invariably most fruitful results; and all the experience of the Department since has confirmed us in the faith which the experience both of England, Scotland, the Continent, Canada, and America, had implanted in our minds.

“Now what are the functions, the work, and the qualifications of the itinerant instructor? His principal function, in a word, is to be the guide, philosopher, and friend of the existing farmers. While, no doubt, a good many of the younger generation, even of the boys of school-going age, will derive benefit from the teaching of the itinerant instructor, and while he will render an important service in supervising the practical course of agriculture in the schools in the county to be referred to latter on, still his main concern is with the actual working farmers. For them it would be unnecessary to attempt a scheme of systematic instruction in the principles of agriculture. Comparatively few farmers wish to know by what mode of reasoning the scientific expert arrives at the conclusion that while one class of soil would be benefited by an application of lime, a second should have a dressing of basic slag, and a third a mixture of basic slag and kainit. Similarly with regard to every branch of agriculture, be it crop raising or milk production, the average farmer wants to know the most profitable practice to follow under a given set of conditions. Tell him this and he will readily dispense with the scientific reasons on which the advice is based. But for all that, much can be done even in this process to increase the number of thinkers among the farming classes. Exactly what effect we may produce time and the working out of the entire scheme alone can show. But we should aim at making every farmer an observer, an experimenter, and so a possible contributor to the progress of Agricultural Science. Of course we all know that the chief means to this end is by supplying the youth of the country with such a training as will give them the power of working out agricultural problems on a scientific basis. But by bringing home to the existing farmers what is the practical outcome of that which has already been accomplished by the application of science to agriculture, a good beginning can be made. Some people believe that this can be accomplished by means of the agricultural press and leaflets. We hold strongly that printed information cannot possibly be made as efficient as the living agent.

“The itinerant instructor must be a man who has had a first-class training in science—such a training as will enable him to rely on his own judgment in deciding what should and what should not be recommended. But a first-class training in science is not enough. If possible, he should have been born to farming, and should have been steeped in it from his boyhood. Only then can he properly estimate the difficulties with which the farmer has to contend. Incalculable harm has been done to the cause of agricultural education by purely scientific men who too often are accustomed to speak lightly of the farmers' difficulties. In doing so they display great ignorance. Accustomed to work under the constant conditions that can be maintained in the laboratory they

would have the farmer to cultivate his land and feed his animals in accordance with formulæ deduced from laboratory experiments. They overlook the fact that farmers have to contend with a number of varying factors of a meteorological, biological, or economic nature. Some of these scientific gentlemen have themselves tried farming according to formulæ, with the result that they have learned to place a higher estimate on the intelligence of the farmer, and the farmer a lower estimate upon the value of scientific training. The Department will set its face against such teachers of agriculture, and more particularly against itinerant instructors in agriculture who are mere scientists, no matter how distinguished they may be.

“ Before dismissing the question of the qualifications of the itinerant instructor, it is desirable to add that these instructors should be familiar with, and able to accommodate themselves to, the manners and customs and the sentiments of the people. I admit that a sufficient supply of such men will for some time be hard to get. Plenty of them have been born, but few made. We are making some, and the Department will, as I shall presently explain, lose no time in taking the necessary steps to meet the demand for these functionaries which is already growing apace. But it must be remembered that the training of a functionary of this special and important type is not the work of a day, and that it will be wiser to wait for a thoroughly trained and competent man than to appoint a man imperfectly qualified to discharge such very responsible duties.”

The Farming Community of this State has shown a just appreciation of the Hurlstone Agricultural Continuation School, which, however, has now its full complement of residential students. Its success has been established on an indubitable basis, and it has become a question whether other Continuation Schools (not necessarily providing for the accommodation of boarding students) should not be established throughout the country districts of the State. In association with this desirable expansion of Technical Education in a rural direction, the Superintendent is of opinion that Agricultural Continuation Schools should be established, if not side by side, yet in the close vicinity of Experimental Farms—which latter are conducted under the supervision of the Department of Agriculture. Wherever there is an Experimental Farm, there, or within a reasonable distance, should be established a State Agricultural Continuation School. Glen Innes, for instance, is in proud possession of a gaol which has never entertained a single prisoner during the whole course of its projected penitential existence, and nothing could be easier or more intelligibly expedient than its conversion into a State Agricultural Continuation School, in which the theoretical subjects of the course could be studied, the Experiment Farm (only a few miles out of the town, and rapidly reached on horseback) being requisitioned to supply the students with the practical part of their instruction in applied methods and examples. In the admirably placed pastoral and agricultural centre of Cowra, again, a room in the Public School might be utilised for the Technical Instruction, and (as suggested in the case of Glen Innes) the students could ride across to the Experimental Farm for practical illustration. The Superintendent of Technical Education has discussed this arrangement with the Manager of the Cowra Experimental Farm and the Head Master of the local Public School, and both gentlemen

favour such a course with unanimity. At Wagga, yet again, similar arrangements might also be made, and experience gained in other countries shows its absolute practicability. For instance, at Guelph, in the great Dominion of Canada, the Continuation School and the Higher Agricultural Institution are closely related, and there is no appreciable reason why such a principle of educational co-ordination and affiliation should not be introduced into New South Wales, with very considerable advantage to the students in the country districts.

Another branch of Specialised Instruction much wanted, and repeatedly requisitioned for, in the towns and country districts of the State is that of Cookery; and although there are, in some few centres of population, adult classes which are not largely attended, the people generally are unquestionably sincere in the expression of their desire for such tuition. At the time of writing there are twenty centres, representing forty towns, which are anxious to obtain the establishment of classes in Cookery. It is greatly to be hoped that most of these will be initiated by the close of the current year, and supplied with trained teachers, who are at present or who shortly will be, passing through the course given at the Training School of Cookery at the Sydney Technical College.

In looking forward to a future expansion of Technical Education in New South Wales we cannot ignore the fact that compulsory attendance at half-time schools is a *sine qua non* of success. The compulsory attendance in the Primary School should be extended to the age of fifteen years, and supplementary attendance in Continuation and Trade Schools should be imparted up to the eighteenth year. Moreover, closer attention must be given to the requirements of children who purpose entering various trades and industries with a view of earning their livelihood. The true purpose of the Continuation School is the provision, at convenient hours, for the further instruction of those who have entered upon the practical work of life, whether as apprentices, as independent wage-earners, or in the domestic duties of the home; and such a school must strive to meet the requirements of both sexes, of girls as well as of boys. The Continuation School presupposes a sufficient basis of Elementary Education, but, where such is defective, it endeavours to supply the *lacunæ*. The lower age-limit of its pupils varies according to the age at which boys and girls are released from compulsory attendance at the Elementary Day School. In the more advanced stages of its work the Continuation School includes many different forms of Adult Education, and the higher age-limit of its province is therefore undefined. The task of the Continuation Schools, which we hope shortly to see established in all the leading centres of New South Wales, thus falls into two main, though not clearly demarcated, divisions (as pointed out by C. T. Millis, M. E. Sadler, M. S. Beard, and other educational authorities), to wit, the Elementary and the Advanced. Its work is in part General Education but increasingly, though by no means exclusively, Technical. Its function is twofold, namely, to prepare its pupils for the efficient discharge of the duties of citizenship, and to increase their power and skill in breadwinning occupations. For those who leave the Elementary Schools at 13 or 14 years of age, and cannot proceed to a Secondary Day School, the Continuation School attempts to give, during adolescence, and early manhood or womanhood, such opportunities of further training as the exigencies of employment may permit.

It has been sufficiently pointed out in the preceding pages of this monograph that the weak spot in the system of Continuation Schools, both in France and England, lies in their failure to carry forward without break the intellectual and moral discipline begun in the Elementary Day School, to attendance at which alone, in both countries, legal compulsion now applies.

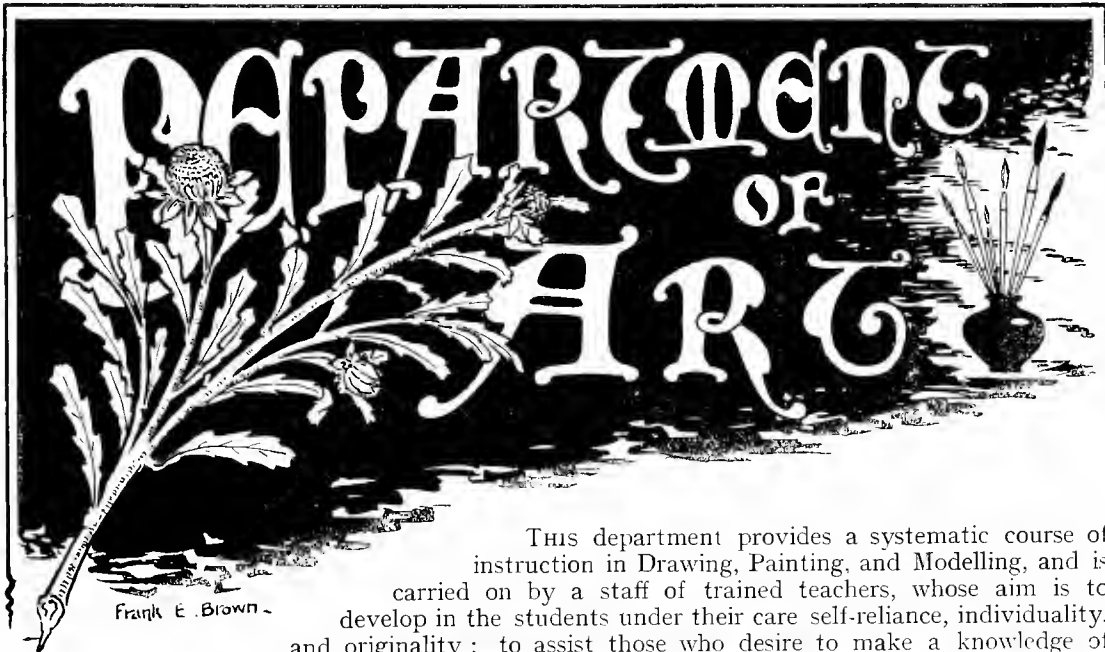
New South Wales, in planning her system of future State Secondary Education must be careful not to fall into the error of complexity regarding the age limit of Primary Instruction which characterises disadvantageously much that is good and useful in this type of instruction in Great Britain. For instance, in England and Wales the limits of compulsory attendance at school vary (a minimum being prescribed by Statute) according to the by-laws of different districts. The main provisions of the present law may be summarised as follow:—(a) Children may be employed in Agriculture at the age of 11 (if the local by-laws contain a special provision to this effect) provided that they attend school 250 times a year up to the age of 13. (b) With this exception no child under the age of 12 can obtain either partial or total exemption from the duty of attending school. (c) A child between 12 and 13 (or, if the by-laws so provide, between 12 and 14) can only obtain total or partial exemption upon the conditions which the by-laws of the district prescribe. (d) In those districts in which the by-laws are still restricted to children under 13 years of age, a child between 13 and 14 can obtain total exemption either on passing the Fourth Standard, or on having made (since reaching the age of 5 years) 350 attendances in not more than two schools during each year for five years, whether consecutive or not. (e) A child between 12 and 14 may claim partial exemption (if such exemption is allowed by the by-laws of the district in which the child resides) on having made 300 previous attendances in not more than two schools during each year for five preceding years, whether consecutive or not. As Sadler very pertinently remarks:—

“ There is mischief in the present state of things, moral mischief as well as physical and intellectual. City life is making the danger worse. Unskilled employment at 13 with good money tempts a boy like a baited trap. He is drawn into a way of life which leaves him at 16 or 17 without a trade to his fingers and with the habit of steady learning gone out of his head. If we ask the Elementary School Master about it, he says that much of what he and his colleagues have succeeded in doing for such a boy disappears during the two or three years immediately following the Day School Course. If, on the other hand, we ask the teachers of the Technical Evening Classes, we find them hampered by the fact that many of those who wish to enter have forgotten much of the knowledge which they require as a foundation for technical work. Thus, inquiries which began at opposite ends of the line lead to one and the same conclusion, namely, that the years between 13 and 16 or 17 are the point of educational leakages; that we have, as it were, laid down a costly system of water supply, but have left badly leaking pipes just behind the tap; and that some change is needed in our educational regulations in order to clench the work done in the Elementary Day Schools, and to provide a sounder foundation for efficiency in skilled trades, and in the duties of home life.”

This again is how the question presents itself to a group of writers who well know the conditions of city life and the nature of the London boy. It will be well for us in New South Wales, in Sydney, to take the following warning carefully to heart:—

“ The type that will be needed in the future is the type of skilled and versatile minds ; the problem of to-day is how we are to produce this type. Will anyone who knows the town boy claim that we are now producing it? Versatile, he certainly is, but his is a superficial and mercurial versatility, produced with fatal certainty by the unstable life of the street. He is the master of a thousand tricks . . . but intelligent he certainly is not, in the way he must be if he and his nation are to prosper. It would be foolish to blame the Elementary Schools for this ; considering his difficulties—especially the migratory habits of families, and the necessarily large classes—the Elementary School Teacher produces very wonderful results, but the moral results are perhaps more wonderful than the mental. And, however good the teaching may be, however successfully the brighter children may be taught a great deal more than is learned by the children of the wealthier classes by the time they are 14, there can be no question that the average boy, still more the stupid boy, is turned out to live his life and earn his wage without the equipment he now needs. His education stops at the most critical point ; he has not yet learned to apply his little knowledge to any practical use ; has not yet brought it into rotation to any purpose—even an easy sum in arithmetic, stated in an unaccustomed way, will seem to him insoluble,—and the habits of observation, of which the foundations have been well enough laid in the school soon fall to pieces for lack of continuous stimulus and training. His employment as errand boy, or van boy, or messenger, bottle-washer, or what-not, sharpens his wits in a few directions, but leaves his mind unworked in many and untrained in all. At the age of 18 he is usually rather more ignorant than he was at 13—a matter of small importance ; but also much less capable of learning—a matter of the very greatest importance. Five years of idleness has had its effect ; half his mind, his working half, has lost, not gained, in strength. How is this loss to be prevented? . . . There is only one conclusion—either the Day School Education must be prolonged beyond the age of 14, or the Evening School must be made compulsory.”

This is the great question which confronts the future of Technical Education in New South Wales, and it remains to be seen how our people will meet it, for it is a matter of the profoundest importance, and concerns the country as a whole no less than the individual boy or girl who goes to make up the total population.

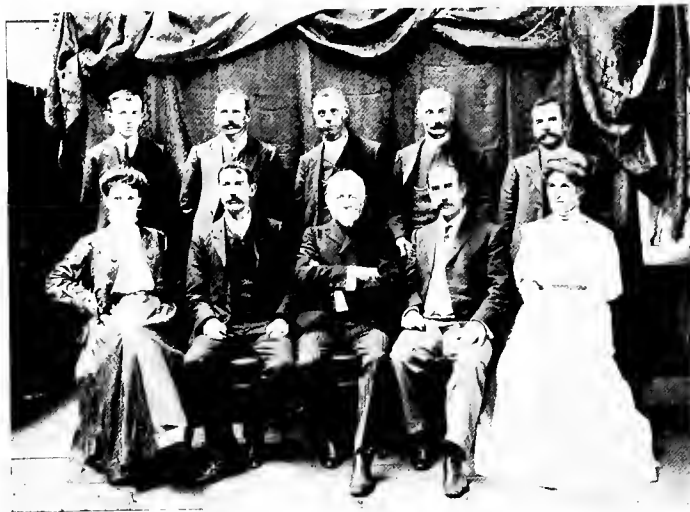


Frank E. Brown.

This department provides a systematic course of instruction in Drawing, Painting, and Modelling, and is carried on by a staff of trained teachers, whose aim is to develop in the students under their care self-reliance, individuality, and originality; to assist those who desire to make a knowledge of

Art a part of their general education; also, to give facilities for the training of persons who intend to adopt Art as a profession, or to include it in their general qualifications as Teachers in public, elementary, or other schools.

The courses of study comprise :— Freehand and Model Drawing; Drawing, Painting and Modelling from the living human model; Geometrical Drawing; Orthographic and Perspective Projection; Drawing, Painting, and Modelling Ornament; Flower Painting and Plant Drawing from Nature; Landscape Drawing and Painting from Nature; China and Glass Painting; Fine Art Pottery; Drawing, Painting and Modelling from the Antique Figure; Still-life Painting: Pen and Ink Drawing, and Repoussé Work.



STAFF OF ART DEPARTMENT.

Reading from left to right—

Front Row: Miss Blakemore, Mr. Reid, Mr. Wright (Lecturer in charge of Department), Mr. Thomas, Miss Brown.

Back Row: Mr. H. B. Wright, Mr. Atkins, Mr. Auroisseau, Mr. Peach, Mr. Macintosh.



DRAWING AND PAINTING FROM LIFE.



LIFE CLASS STUDENT'S WORK.

LIFE.—Drawing and painting from the living model forms an important part of the course of Art at the College, and may easily be classed as the most difficult of all Art studies; its importance is beyond question.

There are day and evening classes, one of which (day) is for ladies only, under the direct supervision of a lady teacher, Miss R. Blakemore, who has three lessons per week, two for the figure and one for portraiture. An evening class, conducted by Mr. A. G. Reid, is for those students whose work occupies them during the day, but who find it necessary to study from life for decorative purposes, illustrating, modelling, &c.

The illustration here shown is taken from the Life Painting Class at Work. This class is under the direct supervision of the Lecturer in charge of the Art Department.

ANTIQUE.—Drawing from the antique is a most important Art study, and closely associated with that of life. Most of the Art students pass through this class before entering for life drawing, but many practise the two together; it is a two years' course. In the first year the student is kept fully occupied in drawing and shading from the head, bust, feet, hands, and other details of the figure, while in the second year the full figure engages their whole attention.



DRAWING FROM THE ANTIQUE.

Students at work.

Our illustration shows the students of the day class at work, with their teacher, Miss R. Blakemore.

There are both day and evening classes. The evening class, under Mr. G. H. Aurousseau, is attended chiefly by artisans, and others who are engaged during the day but who require this knowledge for their several occupations or crafts.

STILL-LIFE PAINTING.—It is in the Still-Life Class that the student is first introduced to the art of painting in colour, and much depends upon the way in which he is handled whilst going through this course whether his future painting will be intelligently performed or not. It is here also the student finds the practical value of model drawing, which course he has to pass through before being admitted to the painting class. The course of instruction is for two years, during which time the student is well grounded in both oil and water colour painting: painting common objects, fruits, flowers, draperies, &c., composition of line and colour.

The coloured illustration "Old Friends," by Miss G. Swyny, is a good example of the class of work done by the students under Mr. G. H. Aurousseau, the teacher.

FLOWER PAINTING.—This is a popular class, attended mostly by young ladies who are taken through a graduated course of studies in both oil and water colours, and painting direct from nature.

Our illustration shows the students at work with their teacher, Mr. A. G. Reid, in attendance.



STILL-LIFE ROOM, SHOWING FLOWER-PAINTING.

LANDSCAPE PAINTING.—This is a two years' course of study. In the first year the instruction given is made as plain and direct as possible, dealing only with the simplest medium for outdoor study—the pencil. Sketches are made from buildings, &c., showing the practical application of linear perspective, studies of rocks, trees and their growth, skies, foregrounds, values, and composition. In the second year the student paints direct from nature in oil or water colours, receiving instruction in aerial perspective, shadows, reflections, processes and manipulation, as glazing, impasting, scumbling, &c.



STUDENT'S WORK, STILL LIFE--"OLD FRIENDS"

By Miss G. SWINY.



FLOWER-PAINTING: WARATAHS AND ROCK LILY.

Water colour, by Miss G. E. Brown.



LANDSCAPE CLASS AT WORK.



CHINA-PAINTING CLASS AT WORK.

There are three lessons per week, one of which is held on the Saturday afternoon to admit of those students who are otherwise engaged during the week taking up this ever-fascinating study.

The illustration shows the students at work, with their teacher, Mr. A. G. Reid, sketching one of the many beautiful views of the Sydney harbour, from the Domain.

The coloured plate seascape is by Miss Forsyth, a student of this class.

CHINA PAINTING.—This class is a very popular one, chiefly attended by ladies; over one hundred students entered for the subject last year (1908). The full course of instruction lasts two years, but those students who have completed the full course may remain at the College to perfect themselves in any special branch. Both day and evening instruction are given.

In the first year students are thoroughly taught the colours used for china painting, and how to mix them, tracing, sketching in outline, the use of the rigger; simple studies in monochrome, the treatment of backgrounds, simple geometric designs for decorative purposes, &c. In the second year, instruction is given in the use of gold and bronzes, their preparation before being used on the ware; raised gold birds and flowers, coloured and chased; painting on coloured grounds with enamels and traced with gold. In all cases where possible, students work direct from nature, using the Australian flowers, which lend themselves so well for china painting.



EXHIBITION OF STUDENTS' WORK—CHINA-PAINTING AND FINE-ART POTTERY.

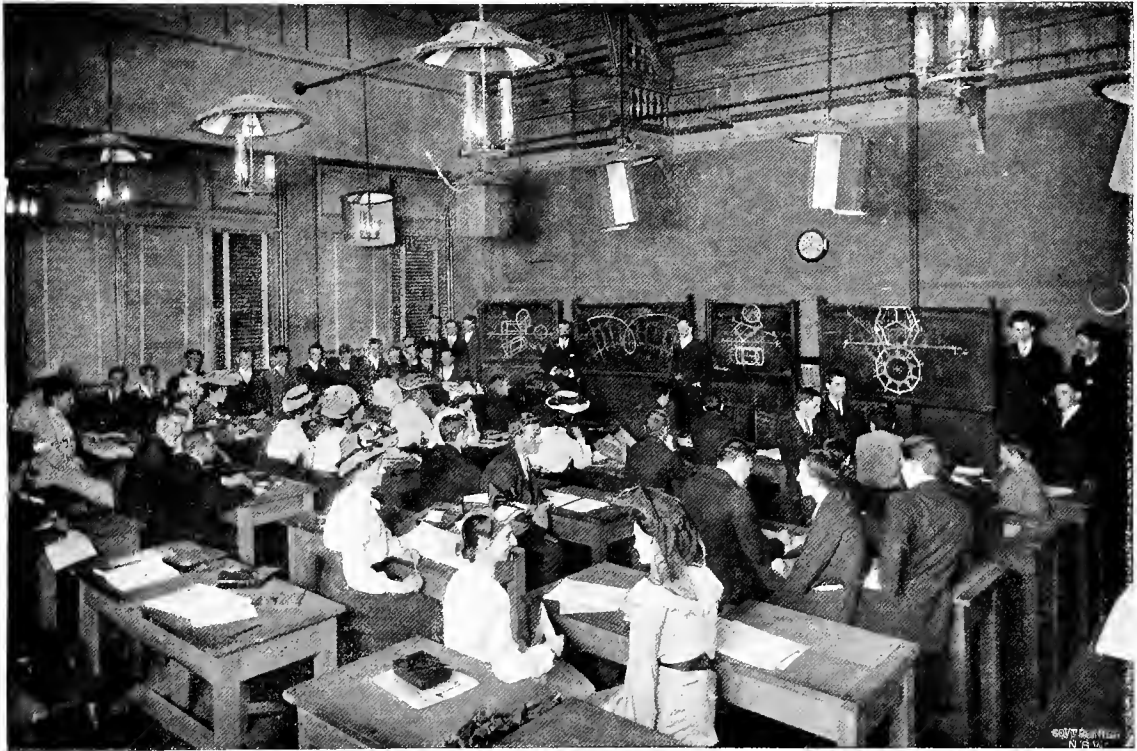
The illustration on page 147 shows a few of the students at work, and that above, a collection of vases, plates, bowls, &c., executed under Mr. J. A. Peach, the teacher of china-painting and fine-art pottery—a class for the latter having recently been started, wherein is taught the making and firing of fine-art pottery, throwing on the potter's wheel; methods of casting models from plaster moulds, such as vases, statuettes, &c., slip-lining, underglaze painting, &c.



SEASCAPE, BY MISS FORSYTH.

PRACTICAL PLANE AND SOLID GEOMETRY forms an important course of study in Art and Technical Education. It is a three years' course, but only the first year is considered as an Art course, while the second and third enter into the deeper studies of the engineer, architect, and all constructional trades or professions.

During the course of instruction many practical illustrations are given of its application, for there is no subject so universally useful in a technical training as plane, solid, and descriptive geometry. The stonemason with his skew arch, the bricklayer in his circular upon circular door and window openings (interpenetration of solids), the boilermaker and metal workers (development of surfaces), the staircase builder with his twisted handrails, &c., the naval architect with his parts having double curvature, the designer of floor coverings, wall papers, tapestry, &c., all depend upon geometry for their first arrangements.



ART DEPARTMENT—PRACTICAL GEOMETRY AND PERSPECTIVE ROOM.

A thorough knowledge of the subject will therefore well repay students for the labour they may bestow upon it. No part of a building or drawing can be laid down or understood without the assistance of practical geometry, nor can any mechanical employment in an engineering or building department be conducted without some assistance from this branch of science.

The illustration shows the geometrical students with their teacher, Mr. F. W. Atkins who is also the teacher of perspective.

There are both day and evening classes; the day class is attended chiefly by the art student, whilst the evening classes (three in number) are attended by students following either a trade or profession.

PERSPECTIVE AND SCIOGRAPHY.—This subject—whilst not so technically useful as geometry—is nevertheless indispensable in a course of Art; coupled with geometry, it is the basis of all object drawing. To the architect, engineer, art workman, and artist it is

indispensable. It is a two years' course of drawing; in the first year simple problems are given in parallel and angular perspective, together with examples of the use of accidental vanishing points; problems, working from plans and elevations of objects without the use of vanishing points. In the second year more advanced problems are given, showing its application for everyday use. Placing in perspective crescents of buildings, arcades, groined ceilings, parts of machinery, delineation of the shadows of objects cast by the sun or by luminous points, the colouring of drawings, &c.

MODEL DRAWING.—This is without doubt the most useful of all the elementary courses of drawing. It is in this class the student receives not only a true knowledge of light and shade, but what is even more important—a structural knowledge of objects, receding planes and lines, so that having passed through the course he finds no difficulty in sketching any object which may be placed before him.

It gives the architectural draughtsman the power of sketching his idea of a building quickly before the labour of setting out his plan and elevations; the same knowledge and skill assists the engineer. To the everyday tradesman it is his language of expression to his fellow workman, for with a few well-directed lines he can at once convey his ideas without the necessity of laboured plans or writing.



MODEL-DRAWING CLASS AT WORK.

In the more advanced studies common objects of different colours are grouped together and the student is trained to render these in black and white, showing their relative values, so that transparent objects, polished surfaces, and non-reflective surfaces are clearly indicated, forming interesting studies.

No art student is allowed to pass into still-life painting until he has passed through a course of model drawing.

There are both day and evening classes, all of which are well attended.

The illustration on previous page shows the students of one of the day classes at work with the teacher, Miss E. J. Brown.

BLACK AND WHITE DRAWING.—The object of this class is to instruct students in the art of drawing for reproduction.

Every art has its limitations, and although at present the best work of the process-engraver may reach far, the average work must be the first consideration, and the student should make his drawing, in every respect, suitable for the purpose for which it is intended; as an instance, an entirely different quality of line work would be used for a daily paper using a rotary press and low-grade paper to that which would be employed for a high-class magazine.

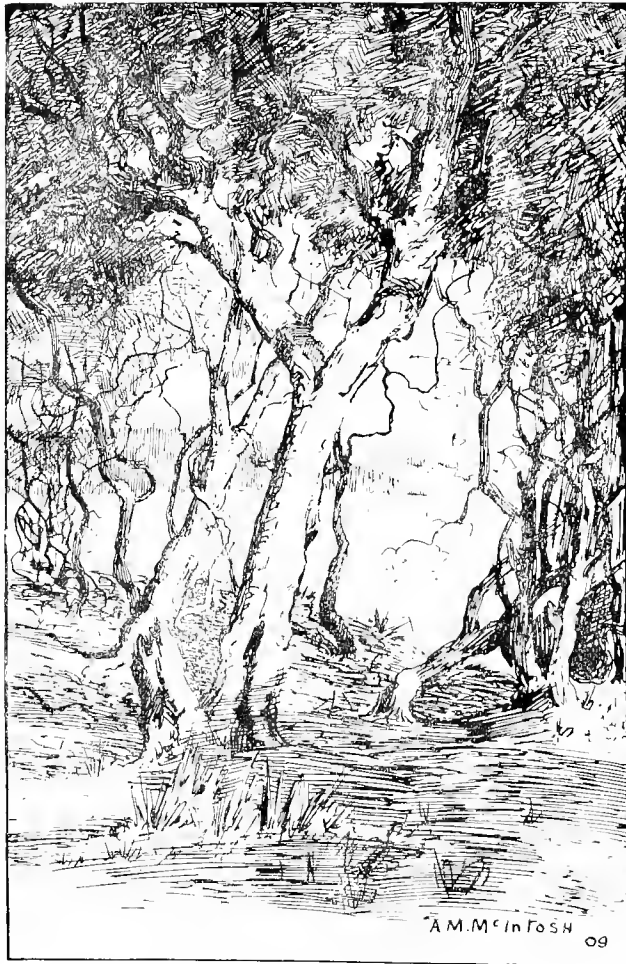
The absolute essential, of course, is good draughtmanship; and this cannot be too much emphasised; no amount of technical knowledge will cover defects in this respect, and the student who wishes to attend this class, and hopes to succeed, must draw, and be ever striving to improve himself in this most important point.

The work covered by Process-Engraving is so wide, ranging from a furniture or other trade catalogue to a veritable work of art, that there is room for many grades of workers. No one should be discouraged by the difficulties in the way, for any one may have special aptitude for this work, which may have been entirely unsuspected before the special effort was made.

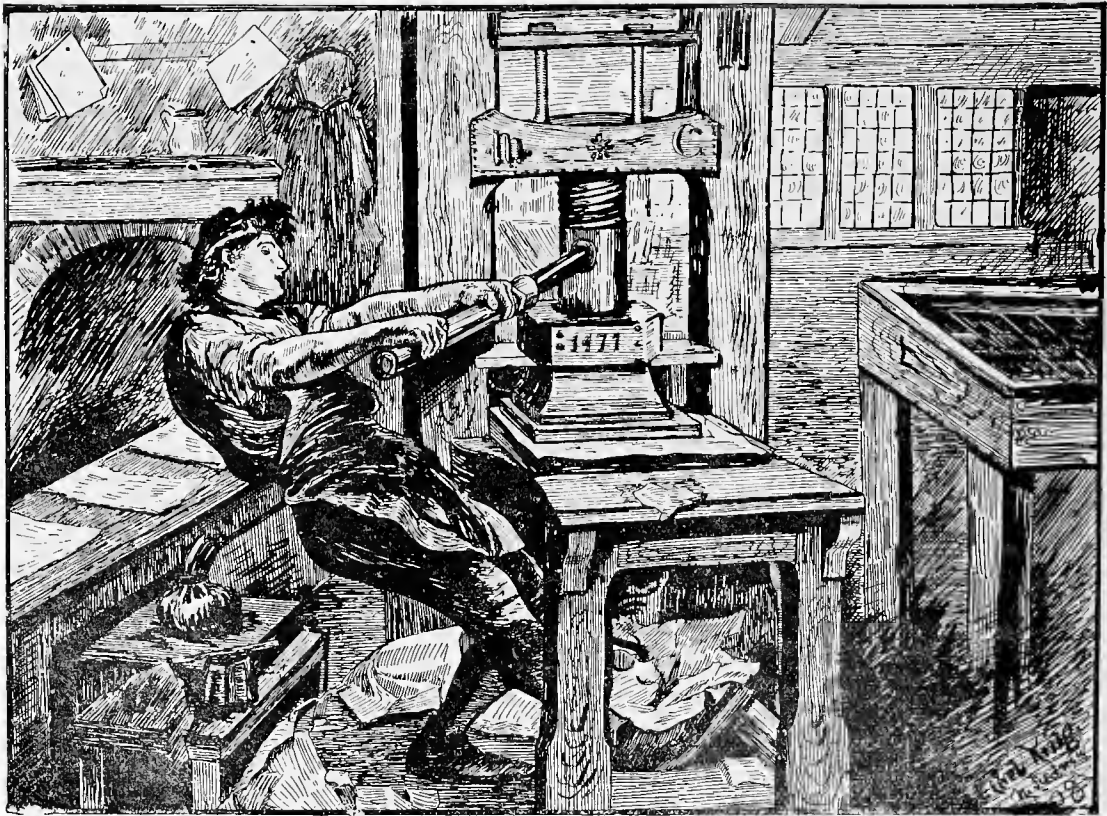
This is a two years' course of study. In the first year the student is practised in elementary pen studies from the cast and from geometrical solids, light and shade, colour values, rendering architectural, landscape, and figure subjects from photographs; sketching from nature, as buildings, and simple still-life studies. In the second year, wash-drawing, composition, and the use of life models; pen and ink studies from life and from portraits; studies from drapery, flowers, and animals.

There are day and evening classes; the day classes are chiefly attended by ladies.

Mr. G. A. Thomas, the teacher of this class, possesses many letters from old students who hold good positions through the knowledge gained whilst under his instruction.



STUDENT'S WORK IN BLACK AND WHITE DRAWING.



STUDENT'S WORK IN BLACK AND WHITE DRAWING.



STUDENT'S WORK IN REPOUSSE.

REPOUSSÉ, although of very ancient origin, is practically a new art in so far as Sydney is concerned. A class in this subject has been in operation for about three years, and during that time has turned out some very creditable work. As evidence of this it may be mentioned that a bronze tankard designed and executed by one of the students, Mrs. E. Soderberg, was last year selected by the Arts and Crafts Society for presentation to Lady Northcote on the eve of her departure for England, as typifying women's work in New South Wales. The course of instruction, which occupies two years, includes the forming of a design, generally the student's own conception, in relief on flat metal, and also the decoration of curved surfaces, such as cups, bowls, vases, &c.

Students are encouraged to become their own tool makers, and are given practical instruction in this branch of their work, thus making them "complete craftsmen."

Our illustration shows a few of the articles executed under the supervision of the teacher, Mr. F. W. Atkins.



MODELLING CLASS-ROOM.

Students at Work.

MODELLING AND CASTING.—This is a most important section of applied art. There are day and evening classes, which are well attended.

The instruction in modelling is divided into ornament, antique, and life. Ornament is a three years' course of study, whilst life and antique are each two-year courses.

The modelling classes are mainly intended for modellers, plasterers, carvers, and terracotta workers, but these are supplemented by many other crafts and professions, who find a knowledge of modelling a great assistance, as painters, decorators, kindergarten teachers, jewellers, architects, confectioners, &c.

The student in going through this course is made familiar with the styles of ornament, the purity of natural and conventional forms, simplicity of design, and is taught how to design for all materials.

As far as it is possible the work executed by the student bears upon the everyday needs of the craftsman, comprising modelling panels, spandrels, string-courses, friezes, capitals, vases, &c. In modelling from life, also, the student is trained to apply his knowledge and skill in the use of the figure for decorative purposes, either for the exterior or interior of buildings.



EXHIBITION OF STUDENTS' WORK.

Modelling Class.

In the casting class, which is a two years' course, the student is made familiar with all methods,—casting from waste moulds, gelatine, wax, sulphur, and plaster piece-moulds; moulding and casting from simple objects from nature, as fruits, flowers, leaves, &c.; also casting from the human figure, hands, feet, and the full figure from life, casting fishes, reptiles, &c.

The illustration on page 153 shows the class-room with some of the students at work; on the left of this picture may be seen two fine pieces of modelling—Jason, which is a full-sized reproduction from the figure by Michael Angelo; the other "Night," one of the figures from the de Medici Tomb, by the same sculptor. These were modelled by Mr. G. Doble, a student of this class, under the supervision of Mr. G. Macintosh, the Instructor in Modelling.

Many are the youths who have benefited largely by attending these classes, and who are now holding good positions in different parts of the Colony.

PROGRAMME OF CLASSES.

DEPARTMENT OF ART.

J. R. WRIGHT, Lecturer in Charge of Department.

DAY CLASSES.

DRAWING.

PLANE AND SOLID GEOMETRY—Monday, 2 to 4 p.m.

PERSPECTIVE—Tuesday, 2 to 4 p.m.

MODEL AND OBJECT—Tuesday, Wednesday, and Thursday, 10 to 12 noon, and Tuesday and Friday, 2 to 4 p.m.; Saturday, 10 a.m. to 12 noon.

FREEHAND FROM THE CAST—Wednesday and Thursday, 2 to 4 p.m.; Saturday, 10 a.m. to 12 noon.

PLANT DRAWING IN OUTLINE AND COLOUR—Tuesday, 2 to 4 p.m.

* BLACK AND WHITE (Pen and Ink and Wash Drawing)—Monday, 10 a.m. to 12 noon.

* ANTIQUE (DRAWING FROM)—Thursday, 2 to 4 p.m., Friday, 1 to 3 p.m., Saturday, 10 a.m. to 12 noon; also for Second Year Students, Thursday, 10 a.m. to 12 noon at the National Art Gallery.

* LIFE DRAWING (LADIES)—Wednesday, 10 a.m. to 12 noon, and 1 to 3 p.m. Head Studies from Life, Friday, 10 a.m. to 12 noon.

* REPOUSSE WORK—Friday, 10 a.m. to 12 noon.

PAINTING.

* FLOWER PAINTING—Tuesday, 10 a.m. to 12 noon, and 2 to 4 p.m.

* CHINA PAINTING—J. A. Peach, Wednesday and Friday, 10.30 a.m. to 12.30 p.m., and 2 to 4 p.m.

* GLASS PAINTING—J. A. Peach, Monday, 2 to 4 p.m.

* LANDSCAPE PAINTING—Wednesday, 10 a.m. to 12 noon, and Saturday, 2 to 4 p.m.

* ANIMAL PAINTING—By arrangement with Lecturer.

* STILL-LIFE PAINTING—Thursday and Friday, 10 a.m. to 12 noon.

LIFE PAINTING—Monday and Tuesday, 10 a.m. to 12 noon, and 1 to 3 p.m.; Friday, 10 a.m. to 12 noon.
Fees, £1 1s. per term. Thursday, 10 a.m. to 12 noon. Students meet at the National Art Gallery for study, on Wednesday, 10 a.m. to 12 noon.

MODELLING—Gregory Macintosh.

* ANTIQUE—Monday and Thursday, 2 to 4 p.m.

ORNAMENT—Monday and Thursday, 2 to 4 p.m.

CASTING—Friday, 2 to 4 p.m.

* LIFE—Tuesday, 2 to 4 p.m.

* Fees, Senior Scale.

NIGHT CLASSES.

DRAWING.

PLANE AND SOLID GEOMETRY—Monday, Tuesday, and Thursday, 7 to 9 p.m.

PERSPECTIVE—Friday, 7 to 9 p.m.

SCIOGRAPHY—Friday, 7 to 9 p.m.

MODEL AND OBJECT DRAWING—Wednesday and Friday, 7 to 9 p.m.

FREEHAND FROM THE CAST—Monday, Wednesday, and Friday, 7 to 9 p.m.

PLANT DRAWING—Friday, 7 to 9 p.m.

* BLACK AND WHITE (Pen and Ink and Wash Drawing)—Friday, 7 to 9 p.m.

* ANTIQUE (Drawing from)—Monday, 7 to 9 p.m.

* LIFE DRAWING—Wednesday, 7 to 9 p.m.

* REPOUSSE WORK—Wednesday, 7 to 9 p.m.

PAINTING.

* CHINA PAINTING—J. A. Peach, Monday and Friday, 7 to 9 p.m.

MODELLING—Gregory Macintosh.

* ANTIQUE—Monday and Thursday, 7 to 9 p.m.

ORNAMENT—Monday and Thursday, 7 to 9 p.m.

CASTING—Friday, 7 to 9 p.m.

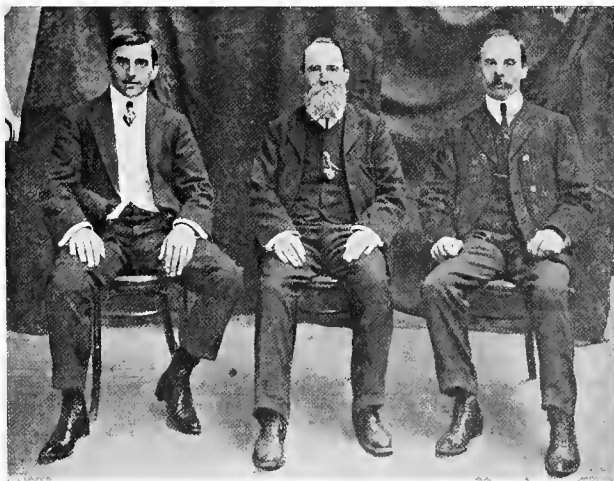
* Fees, Senior Scale.

Agriculture Department.

(By HENRY LORD, G.T.C.A.C., Lecturer in charge of Department.)

ORIGIN OF DEPARTMENT.

THE Department of Agriculture was started by the late Board of Technical Education in 1884, and Mr. R. W. E. McIvor, F.I.C., F.C.S., was the first Instructor. On Mr. McIvor's resignation he was succeeded by Mr. Angus Mackay, F.C.S., as Lecturer in charge of the Department.



STAFF OF AGRICULTURAL DEPARTMENT.

Reading from left to right—Mr. Loel, Veterinary Science; Mr. Lord, Lecturer in charge of Department; Mr. Curnow, Farriery.

When the Government dissolved the Board of Technical Education he remained Lecturer in charge until 31st March, 1897. On his resignation he was succeeded by the writer.

The writer has spent the greater part of his life in the study and practice of agriculture, and the dissemination of knowledge so obtained. At the age of fourteen, while at school at Janze, France, he joined a class in agriculture, and the next year carried off the school's first prize for agriculture. A few years later he gained a scholarship at the entrance examinations, Trois-Croix Agricultural College, near Rennes. The daily work of the college comprised eight hours' practical farm work, and four hours' theory, or science of agriculture. By the end of 1873 he had gained the

Trois-Croix Agricultural College diploma, and in the following February, before he was 22, was appointed manager of Malidor Model Farm, near Le Lude, France, where he remained for three years, during which time he won numerous silver, gold, and bronze medals, at various agricultural shows, besides farm and cattle trophies. Space will not permit mention of various other successes in France, where he was frequently engaged as judge at various functions connected with agriculture. Coming to Sydney in 1879, as private secretary and interpreter to Professor F. de Savignon, French Commissioner for Agriculture at the Sydney International Exhibition, he remained here, and his services were given as a judge in various capacities. He joined the agricultural classes at the Sydney Technical College on February 11, 1889, as a student, and obtained the teacher's (Mr. A. Mackay's) prize "for excellence in agricultural studies," first term, 1889; and afterwards Mr. Mackay's prize "for marked excellence in agricultural studies," second term, 1889. He next obtained first grade, with honours, in elementary (or practical) agriculture (top pass), December, 1889; and first grade, with honours, in advanced agriculture (top pass), December, 1889; was "locum tenens" for Lecturer in Agriculture from February 10 to April 14, 1890; was assistant from August, 1890, to March, 1897; and on Mr. Mackay's resignation was promoted Lecturer in charge of the Department of Agriculture; was elected vice-president of the N.S.W. Chamber of Agriculture in 1904, 5, and 6; President in 1907 and 8, and is still in office.

The writer has visited most of the agricultural colleges in Australasia. He is the author of a paper on "The Farmers' Weights and Measures," read before Australasian Association for the Advancement of Science at the Sydney University on January 12, 1898, and has also written articles on "The Hydraulic Ram on the Farm," "Drainage and Lime in Agriculture," &c.

In January, 1899, he was elected to the Council of the Royal Agricultural Society of N.S.W., and is still on its council, also being a member of its Executive Committee since 1901.



AGRICULTURAL CLASS-ROOM.

Mr. Lord lecturing to the Students.

SCOPE OF THE INSTRUCTION.

GENERAL VIEW.—The leading purposes of the Agricultural Department of the Technical College are to supply—first, the knowledge needful to ensure successful occupation of the land for the very large numbers of both sexes who are desirous of changing town for country life; and secondly, to supply technical scientific experience to those engaged in various branches of agriculture, and who have time for lessons only in their spare hours. The subjects, as taught, are grouped, so as to be as seasonable as possible. The appliances of the College are sufficient for the foregoing, while the cost to students is on a very moderate scale. The instruction given, as the Syllabus explains, is comprehensive, including:—

The main divisions of agriculture—Live stock, horses, cattle, sheep, dairying, pigs, poultry, and bees; general crop farming, for the colder and semi-tropical sections of the country; orcharding, vineyarding and wine-making, fruit-growing, factory processes of fruit-preserving, market and general gardening, flower culture,— and other divisions.

Soil examinations and the relations of geology, botany, chemistry, physics, the indigenous timbers, grasses, and herbs to the qualities of Australian soils, and what they are most capable of producing; also, drainage, irrigation, mechanics of agriculture, use of tools and implements, &c.

The science of dairying, the nature of chemicals for checking and destroying fungus and insect enemies, &c., the making and compounding, and the qualities and uses of manures for making crops, including the chemistry operations required. In the second-year course are included agriculture, soil tests, plant analysis, the chemistry of wine-making, the agencies for producing cold, chilling, freezing, &c., sugar-making, distilling, milk and water tests, compounding of fluids for destroying fungus and insect pests, and other matters of importance in agricultural practice.

FIELD LESSONS.—In order to make the instruction as practical as circumstances permit, the classes go out for field instruction as opportunity offers during the entire year. The students

are mostly adults, and being prepared in the class-room for the work to be done, and taking, as they do, a personal business interest in it, general knowledge of soils, native vegetation, and other qualifications for land occupation are acquired readily; and students become expert in pruning and other operations of field and garden practice. Poultry and bee-keeping are taught practically. Those desirous of advancing further in theoretical and practical chemistry, botany, geology, the business of wool-sorting and classing, farriery, carpentering, blacksmithing, and other branches useful for country residents, are always encouraged to join the special classes for those occupations.



The following syllabus gives an outline of the instruction available for first, second, and subsequent courses of instruction. The subjects taught are arranged specially for suburban and country residents.

Elementary Agriculture.—First Year—Australian Agriculture (Character and Prospects); Climate and Rainfall; Selecting Land, Clearing, Building, Fencing, &c.; Agricultural Draining; Mechanics of Agriculture; Cultivation of Crops; Grain Crops; Root Crops; Making and Using Manures; Live Stock in Australian Agriculture; Dairying; the Pig; Poultry; Bee-keeping; the Home Garden; Fruit Culture; Flowers, &c.; Fungus and Insect Pests; Seasonable Work for the whole Year.—Lessons in seasons.

Advanced Agriculture.—Second Year—Scientific Aspects of Agriculture; What Indigenous Vegetation tells of the Soil, Climate, Seasons, &c.; Australian Experiences; Irrigation, Water Storage, &c.; Live Stock in Australian Agriculture; Orchard-ing; Sheep and Wool; the Horse in Australia; Advanced Dairying; Value of Feed Materials; Manures; Rotations in Cropping; Semi-tropical Farming; Crops we might grow; Chemistry on the Farm; Chemistry in the Dairy; Fruit-Preserving; Grape-vines in Australia; Fungus and Insect Enemies.



PRACTICAL HORSE-BREAKING—THROWN.

An Afternoon Class is held in the College on Tuesdays, at 4.30 p.m. The course includes Soil Examination; Qualities and Uses of Indigenous Grasses, Shrubs, Trees, &c.; Principles of Plant Life; Australian Seasons; Rainfall; Seed-sowing; Planting; Pruning; Propagating; Hybridising; Vegetable, Fruit, and Flower Gardening, Fruit-Preserving; Poultry and Bee Farming; Silk Culture; Dairying for Milk, Butter, Cheese; Tests for Water, Milk, &c.; Fungus and Insect Pests, their Nature, Detection and Treatment, and such other subjects as may be suitable and seasonable.

Special classes for Dairy Science, &c., are held in the College on Wednesdays. The subjects are outlined in the foregoing syllabus, advanced course.

Country Classes for Special Subjects.—Arrangements may be made, through the Superintendent, at the Technical College, Sydney, for special courses of instruction, extending over eight or more weeks. Any of the subjects in the foregoing syllabus can be chosen.

Arrangements can also be made for single-lesson lectures on any of the foregoing subjects, for Schools of Art, Agricultural Societies, and other public bodies, as opportunity offers.



PRACTICAL HORSE-BREAKING—TRAINED

WORK OF THE CLASSES.

The enrolments for last year in the Sydney Agricultural classes were ninety-one (including four ladies); the average age of the students being over 30 years.

During the year, besides the regular class-work, twelve outdoor lessons were given, viz.:—At the Royal Agricultural Society's Show at Moore Park, and various orchards, vineyards, dairy farms, pig farms, and poultry farms, &c. The Council of the Royal Agricultural Society of New South Wales kindly allows the students free admission for one day to their Easter Show, and full advantage is always taken of this favour, the students being accompanied by their instructor, who explains to them the principal points of the leading exhibits in the various sections. Especial attention is given to farm produce—the district societies' exhibits, the Government exhibits from the various agricultural colleges and experiment farms, the hydraulic rams, sub-soil ploughs, dairy cattle, pigs, poultry, &c., &c.

At one of these outings—that to "Waverley Dairy," at Bondi, where 185 cows are milked, the milk from twenty cows was tested for butter fat by the senior students, under the supervision of the instructor.

The work is of a thoroughly useful character, calculated to give the students an insight into the practical work of the farm, garden, and orchard.

SUCCESSFUL STUDENTS.

The value of Technical Education in agriculture is well illustrated by the fact that a number of our ex-students now occupy prominent positions in the agricultural world.

The following cases furnish a few illustrations of the above statement:—

Mr. George Valder became Manager of the Wagga Experiment Farm, then Principal of the Hawkesbury Agricultural College, then New South Wales Government Commercial Agent in South Africa, and is at present Chief Inspector of Agriculture in New South Wales.

Mr. W. Brooks is manager of the Government Sewage Irrigation farm at Arncliffe—Botany.

Mr. E. H. Gurney is Agricultural Chemist at the Queensland Agricultural College at Gatton (Queensland).

Mr. S. Cheetham is head gardener at Callan Park Asylum, where vegetables are grown for something like one thousand persons.

Mr. Quodling is Inspector of Agriculture in Queensland.

Mr. A. Martin is manager of one of the Experiment Farms in Queensland.

Mr. G. L. Sutton, who was experimentalist at the Hawkesbury Agricultural College, is now manager of the Experimental Farms at Cowra and Coolabah, besides being Wheat Expert to the Department of Agriculture, succeeding the late Mr. W. Farrer to that position.

Mr. W. R. Fry was orchardist at the Bathurst Agricultural College, then first manager of the Government Experiment and Irrigation Farms at Moree, and is now one of the Government fruit inspectors.

Mr. A. A. Dunnicliff, junior, is poultry editor on the "Daily Telegraph."

Mr. Frank McMullen, M.A., who went through the two-years' course in Agriculture as recently as 1904-1905, is now principal of the Hurlstone Agricultural Continuation School.

Mr. C. F. Jeanneret has been recently appointed experimentalist at Wagga Experiment Farm and College.

A large number of ex-students are at present successful farmers all over the States.

A feature of the last two-years' classes was that about one-third of the students were Public School Teachers.

The three photos illustrate the practical horse-breaking lesson for saddle, harness, or plough—work which is included in the practical teaching of Agriculture.

ELEMENTARY VETERINARY SCIENCE.

THESE classes, which are under the charge of Mr. B. B. Loel, G.M.V.C., are not formed with the object of producing Veterinary Surgeons, but to impart a sound, practical, and theoretical knowledge in elementary Veterinary Science to those who have the care and management of live stock committed to their charge, and to individuals who are interested in the welfare of those animals subservient to man.



ELEMENTARY VETERINARY SCIENCE LECTURE-ROOM.

The Syllabus is specially prepared in order that students who purpose fulfilling such duties as those of Inspector of Stock, or Inspector of Dairies, may receive the scientific education necessary to fit them for such positions.

During the first year, the elementary anatomy and physiology of domesticated animals are taught, whilst in the second year the lectures delivered deal with the care and management of live stock and the symptoms and treatment of diseases common to these animals.

In order to facilitate the work of the students, carefully prepared diagrams, specimens, and dissections are used to illustrate the lectures. Visits are also arranged to various places where information may be gained, and practical demonstrations given when possible.

The course extends over three years, and may be epitomised as follows:—

First Year.—Anatomy, Physiology.

Second Year.—Stabling, the Horse, Breeding, Purchase of Horses, Soundness and Unsoundness, Lameness, Diseases, Injuries and Wounds, Operations.

Cattle—The critical points; characteristic features of various breeds; diseases.

Sheep—Diseases.

Swine—Common diseases and treatment.

The Dog—Symptoms and treatment of prevalent maladies.

Practical demonstrations are given when possible, and include:—

- (a) Methods of conducting *post-mortem* examinations. (b) Dissection. (c) Practical lessons on the horse; his points, marks, breed, colour, age, &c.; handling, clothing, and bandaging of horses; methods of approaching and examining sick animals; methods of throwing or casting horses for operation; methods of administering medicines to horses.

Third Year.—Veterinary therapeutics. Veterinary medicine and surgery. Operations where practicable.

FARRIERY.

The course of instruction in Farriery, which is in charge of Mr. John Curnow, extends over one year, and is specially adapted to impart to improvers and apprentices a thorough and practical insight into their work, and thus supply a long-felt want.

The horse's foot is looked upon by the average individual as a block of inert matter at the extremities of the limbs, instead of which it is one of the most highly organised and specialised structures known to anatomists.

Many horses are rendered cripples and their usefulness prematurely ended through ignorance of the structure and functions of the vital parts of their feet. The Farriery class offers to all farriers a ready means to acquire this knowledge; and it is hoped that a "Certificate in Farriery" will become recognised as a necessary credential in the trade.

To gain a Certificate in Farriery the student is required to pass both the theoretical and the practical examinations.

The course is illustrated by preparations, models, casts, drawings, and anatomical specimens.

The instruction may be epitomised as follows:—

- (a) The History of Farriery; (b) Anatomy of the Foot; (c) The Physiology of the Foot. (d) Principles of Shoeing; (e) Diseases of the Foot; (f) Surgical Shoeing; (g) Practical Shoeing.

Special arrangements are made for Practical Lessons.

TEXT BOOKS.

Hunting's "The Art of Horse-shoeing."

"Horse-shoeing and the Horse's Foot," by Dollar and Wheatley.

PROGRAMME OF CLASSES.

HENRY LORD, G.T.C.A.C., Rennes, France, Lecturer in charge of Department.

AGRICULTURE (Elementary)—Tuesday, 7.30 to 9 p.m.

(Advanced)—Wednesday, 7.30 to 9 p.m.

DAY CLASSES for Fruit and Flower Gardening, Poultry and Bee Farming, Tuesday, 4.30 to 6 p.m. Analysis of Milk, Butter, Soils, &c., Wednesday, 4.30 to 6 p.m.

FARRIERY—John Curnow, Friday, 7.45 to 9 p.m.

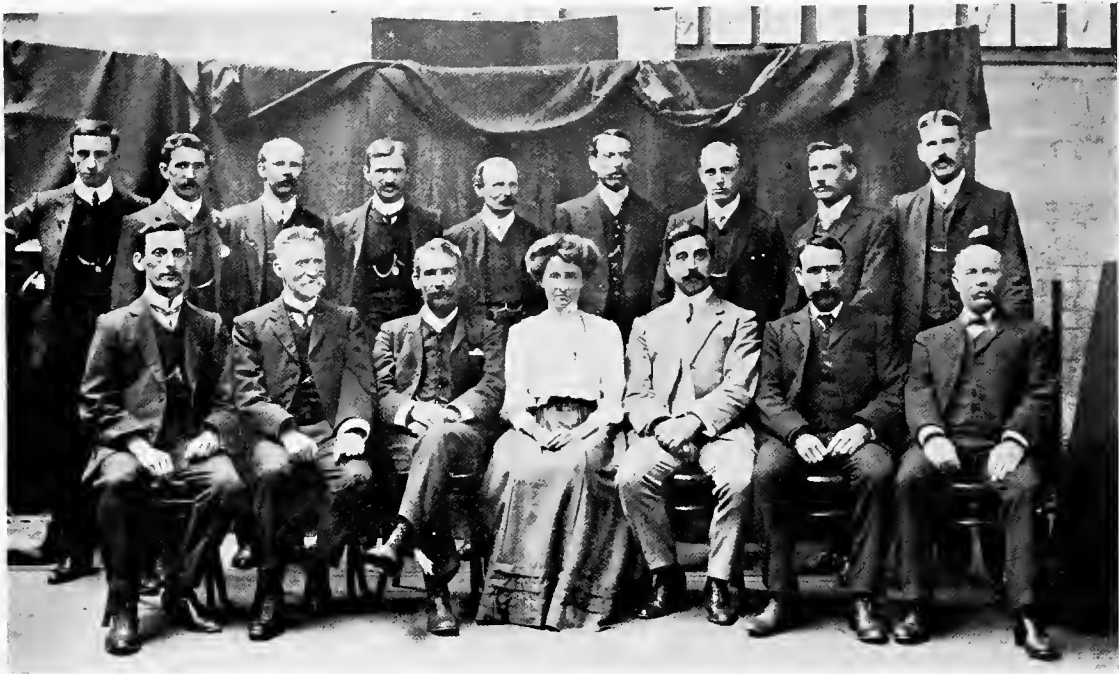
VETERINARY SCIENCE—B. B. Loel, G.M.V.C., Monday, first year, 7.30 to 8.30 p.m.; second year, 8.30 to 9.30 p.m. Practical Demonstrations, fortnightly during 1st and 3rd terms.

Department of Architecture.

[By JAMES NANGLE, F.R.A.S., F.I.A. (N.S.W.), Lecturer in Charge of Department.]

HISTORY.

INSTRUCTION in Architectural Drawing, Building Construction, Carpentry, Joinery, and Brick-laying has been given since the earliest stages of technical education in this State. One of the



THE STAFF OF THE DEPARTMENT OF ARCHITECTURE.

From left to right—

Front Row: Mr. Roberts, Assistant Teacher of Drawing; Mr. Wilkie, Teacher-in-charge Carpentry; Mr. Nangle, Lecturer in charge of Department; Miss Bannister, Wood-carving; Mr. Hadley, Teacher, Drawing; Mr. Lockley, Senior Teacher, Carpentry; Mr. Bebb, Bricklaying.

Back Row: Mr. Campbell, Assistant, Carpentry; Messrs. Brown, Stewart, Wilkie, Assistant Teachers, Carpentry; Mr. Cooper, Railway-carriage Builder; Mr. Rush, Assistant Teacher, Carpentry; Messrs. Cambridge, Martin, Nurzey, Assistant Teachers, Architecture.

first instructors in Architectural Drawing was Mr. Cyril Blacket, who was followed by Mr. J. F. Hennessy. Then the late Mr. Wright Campbell took charge, and under his care the classes increased very greatly in numbers, and students distinguished themselves by conspicuous success in winning prizes for drawings submitted for competition at South Kensington, London. The classes, both during the time of Mr. Hennessy and Mr. Campbell, were held in the building in Sussex-street, where the accommodation was very poor. After the death of Mr. Wright Campbell, Mr. Cyril Blacket was again appointed to the charge of the Department of Architecture, which position he held for some years. During the late Mr. Campbell's term of office a move was made to a suite of rooms and workshops in the new College at Ultimo. On the resignation of Mr. Blacket, about three years ago, the writer was appointed to take charge of the Department.

There has been, during the last couple of years, a great development in this Department. Originally the trades and drawing classes were in separate parts of the great group of buildings devoted to Technical Instruction at Ultimo. Besides this want of co-ordination of the drawing and trades classes, there was also a great lack of accommodation. The task of providing the location of all the classes relating to building and architecture with plenty of accommodation in one building was immediately undertaken. The scheme then outlined is now practically complete and in operation.

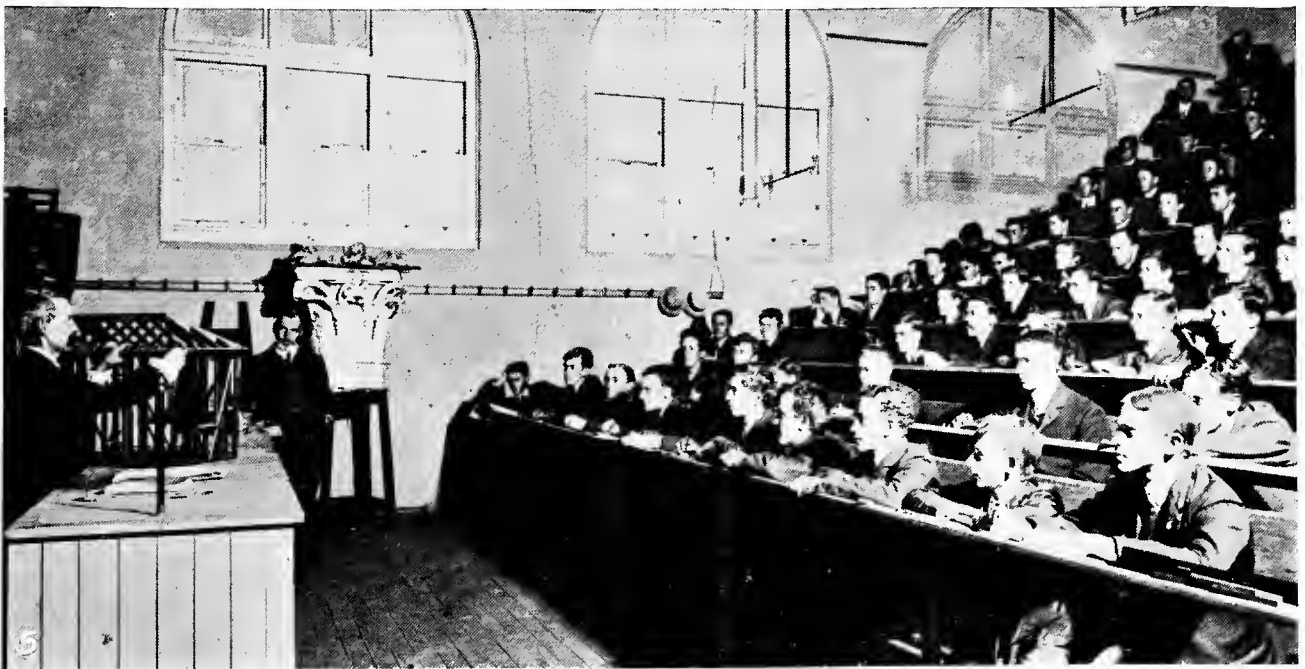
DESCRIPTION OF THE ARCHITECTURE BUILDING.

What was formerly a two-story building, the lower portion of which was given over to Agriculture and store rooms, with the upper floor for a carpenter's workshop, has been greatly extended in plan and increased to three storeys in height.

On the lower floor are located in a large room the wood-working machines, comprising a Fay's No. 2 American solid frame patent variety wood-working machine, small panel planing machine, small saw-bench, large saw-bench, one band-sawing machine for sweeps and circular work, patent fret-saw, lathes for wood-turning, and the necessary additional machines, such as grindstones, emery-wheels, &c. These are driven with electric power and are under the supervision of an experienced wood-working machinist. Adjacent to the machine-room is the Bricklaying room.

On the second floor is the large Carpentry and Joinery workshop, containing fifty benches. At one end of this floor is a large room devoted to the teaching of Wood-carving and Polishing, and wherein are located models of all carpentry and joinery portions of buildings.

The third floor is given up to drawing offices, one each for the first, second, and third years, in construction and architectural drawing, and one for the setting out of work required by the carpentering class. At the end of this floor is a magnificent lecture-room, where students



LECTURE-ROOM FOR STUDENTS IN ARCHITECTURE.

Mr. Nangle lecturing to Class.

in each of the three years in Building Construction and the Styles of Architecture receive their lectures. This room is planned in the form of a theatre, with the seats rising at a rapidly increasing angle, so that all students may have a clear view of the lecturer and demonstration table.

On each of the upper floors are rooms set apart for the testing of building materials. On the second floor is a room where cement limes, and the various kinds of mortar are investigated and tested, while on the top floor under the gallery in the large lecture-room is a room where timbers, stones, and other building materials are tested for strength.

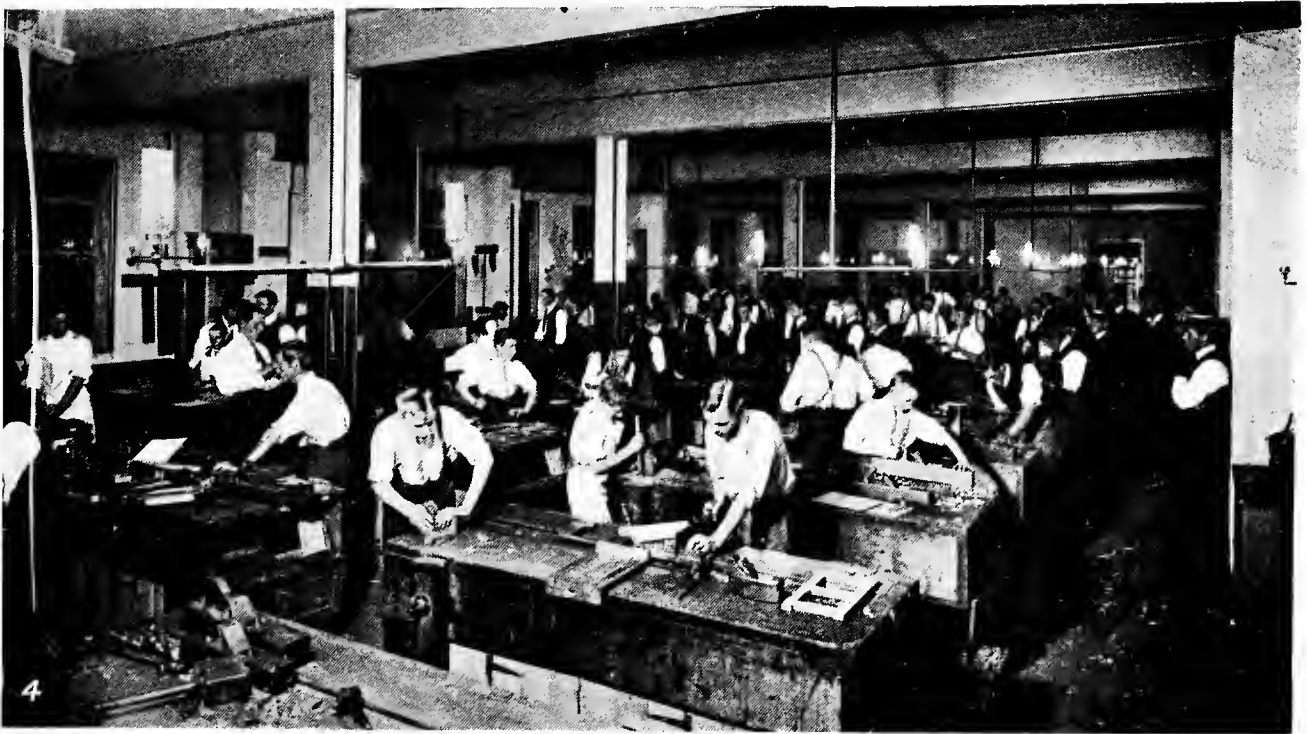
In planning the building great consideration was given to the question of a proper correlation of the various classes; for instance, the Carpentry and Joinery workshop is located as before described, immediately above the wood-working machinery, and access is gained from one to the other by a stair. The Carpentry workshop is again placed just below the drawing office, where the student who is to make any particular piece of carpentry or joinery work will go, to set it out to scale on paper, prior to making it. Access from the Carpenter's workshop to this drawing office above is also gained by means of a stair. The drawing office for the setting out work for the carpentry is also in close touch with the drawing offices, wherein the whole of the details of Building Construction and the Styles of Architecture are studied.

THE SYLLABUS.

The scheme of instruction in the Department of Architecture is, as is necessarily the case in a Technical College, planned primarily with a view to provide for the training of tradesmen by giving them instruction supplementary to that which they receive at their daily work on the building or in the builders' workshop, and to assist each trade in a general knowledge of building construction. The idea is to make not only a better workman at his own particular trade, but also to help him to carry on successfully the duties of foreman, clerk of works, or builder. The practical courses and lectures on Building Construction, however, afford a very useful, and, indeed, a necessary course of instruction for architects' pupils. The course as set out at the College has received the endorsement of the Institute of Architects, and has been incorporated in the syllabus of studies set out for pupils of members of the Institute of Architects. It is also worthy of note that the course receives the endorsement of the Master Builders Association of this State. The master builders are keenly interested in the working of it, and make it a practice to present prizes annually to those students who do well in their studies at the College. Although the principles of construction naturally receive the most attention both in the drawing and lecture classes, as well as in the trade classes, some provision is made for instruction in the features in the different Styles of Architecture. This has been considered a necessity, for even in the case of an ordinary tradesman a knowledge of the Style of Architecture of the building at which he is engaged will enable him to exercise more interest in the shaping of the details. He will consequently be of real assistance to the architect whose designs he is engaged in executing, and a better quality of work generally is likely to be the result.

Previously it was the practice to merely give the students in drawing instruction in the copying of plans of cottages, villas, and such buildings, without much reference to the question of detail. This has been done away with entirely, and now the students are engaged throughout the whole of the three years in the drawing out to various scales of the details of construction of the various parts of a building and the details of the various Styles of Architecture.

The course in CARPENTRY and JOINERY comprises three years' instruction—an advanced year in joinery and two years in stair and hand-railing. The course is sufficiently comprehensive to cover the details most completely of carpentry and joinery, and when supplementary to practical experience on a building, and in the builder's workshop, should provide for the turning out of very capable tradesmen. Particular care is taken that the students make drawings to



CARPENTER'S SHOP, DEPARTMENT OF ARCHITECTURE.



ANNUAL EXHIBITION OF STUDENTS' WORK—CARPENTRY AND JOINERY.

scale of examples which they are to make. This class is under the care of Mr. Wilkie, with Mr. Lockley as principal assistant, who have with them a staff of assistant teachers. The photograph shows the carpentry class at work in the carpentry and joinery workshops, which contains accommodation for 100 students.



THE BRICKLAYING CLASS-ROOM

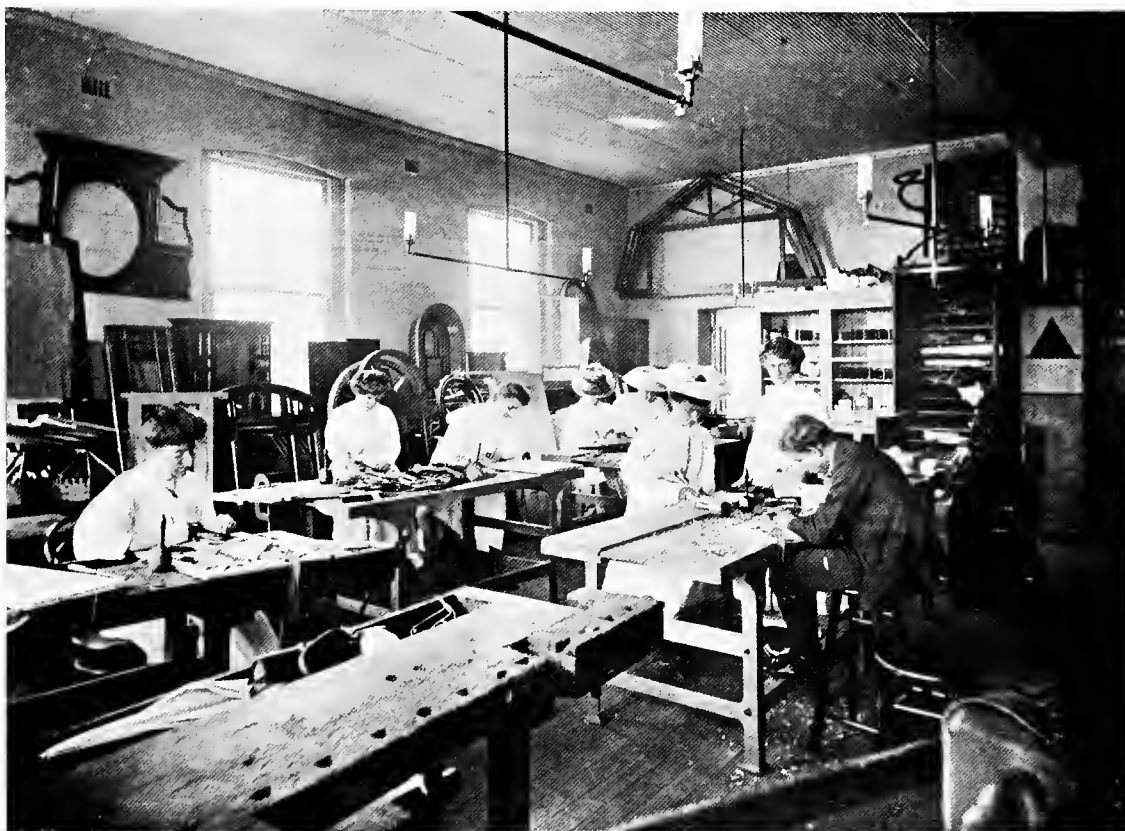
Students at Work.

The BRICKLAYING section comprises a course of practical and theoretical instruction covering three years, and is under the care of Mr. Bebb. The photograph shows the students at work in the room, where they are taught to set out the work full size, and then to build portions of actual walls, arches, &c., with full-sized bricks.

The WOOD-CARVING, controlled by Miss Bannister, comprises a course of three years' instruction, including the preparation and execution of simple designs in the various styles of ornament in Classical, Romanesque, Gothic, Italian, French, and English Renaissance. Advanced designs in the various architectural styles are dealt with in the second year; original designs, their suitability and adaptability to furniture, art, and architectural work. Some examples of the work done in this class are shown by the illustrations.

The WOOD POLISHING and DECORATION class includes a full course of instruction in these trades and is under the charge of Mr. Adams.

The DRAWING OFFICE work, including instruction in the drawing of all constructional and architectural details is, under the supervision of Mr. Hadley, with Messrs. Roberts, Nurzey,

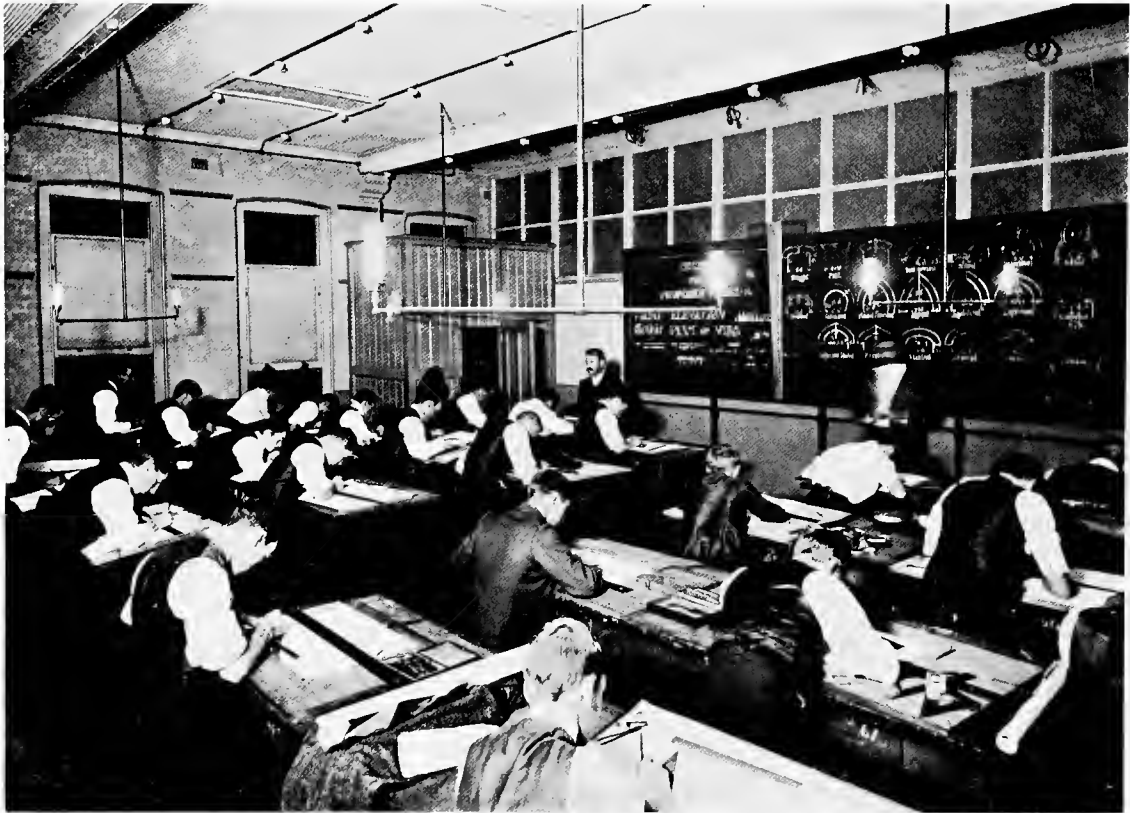


THE WOOD-CARVING CLASS-ROOM.



EXHIBITION, FEBRUARY, 1904, STUDENTS' WORK.
Carpentry, Joinery, and Wood-carving Classes.

and Cambridge as assistants. All the drawing is done to scale from sketches on blackboards in front of the class. The students are thus forced to set plans, sections, and elevations up in a proper way, and are trained to understand what they are doing. The illustrations of examples of construction drawing will serve to indicate the success of the method of teaching this subject as compared with the old style of allowing the students to copy from scale drawings. These examples are drawings made during the stress of the annual examinations in three hours' time from sketches with dimensions marked. A notable feature of the work in connection with



THE 1st YEAR CONSTRUCTION DRAWING-ROOM.

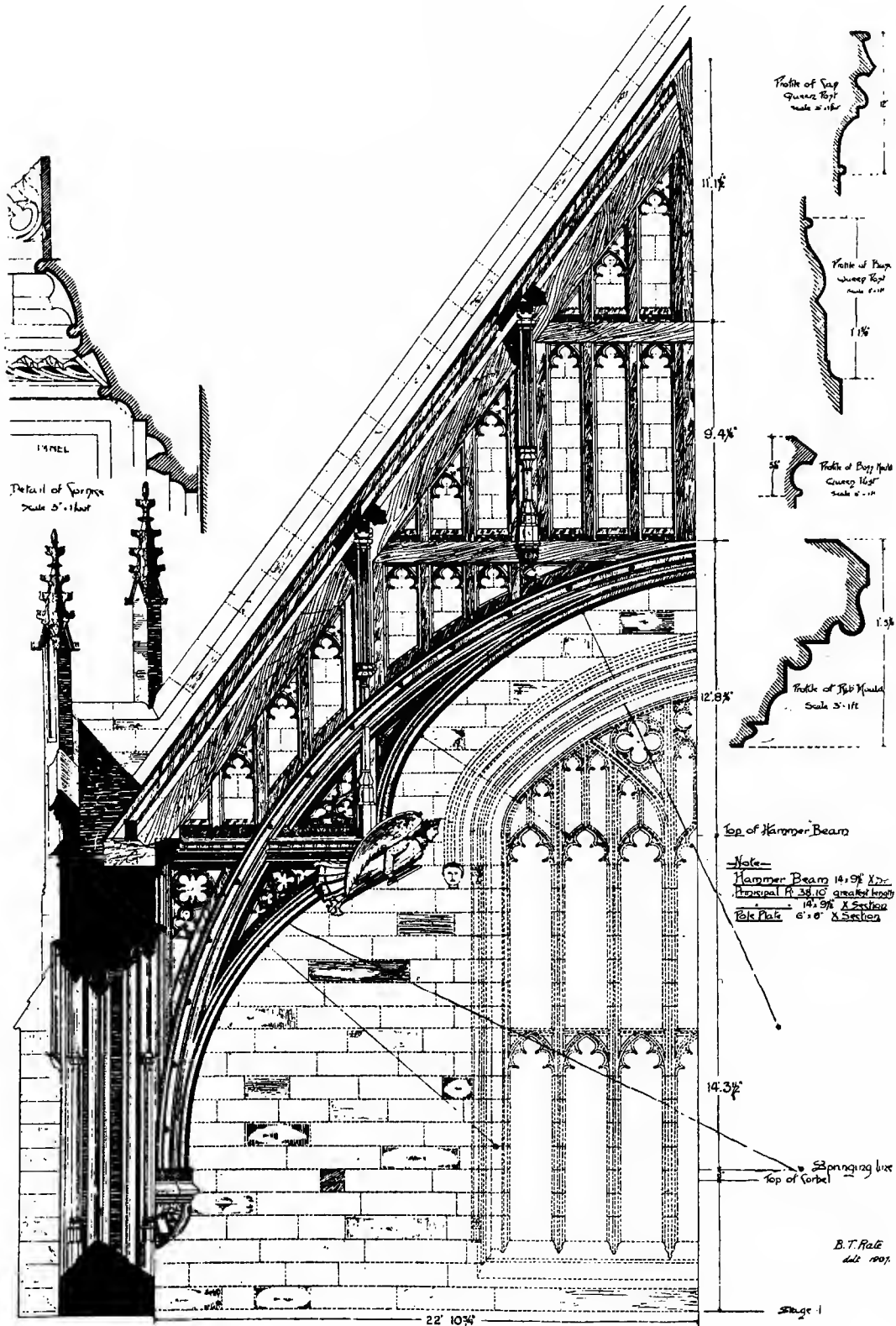
Students at Work

architectural drawing is the measured drawing. The students go with Mr. Hadley to buildings of good architectural style on Saturday afternoon and take measurements. These measurements are used to prepare scale drawings in the class-room. The details of the doorway and roof from the Sydney University, which are illustrated, are examples of this section. The lectures in BUILDING CONSTRUCTION and the STYLES OF ARCHITECTURE, covering three years in each subject, are delivered by the Lecturer in Charge of the Department, who also personally supervises all testing and other experimental work. The lecturer has with him Mr. A. H. Martin as assistant.

A course covering a year's instruction in QUANTITY SURVEYING, giving all the details of taking off and billing quantities in building work is taught by Mr. Stowe.

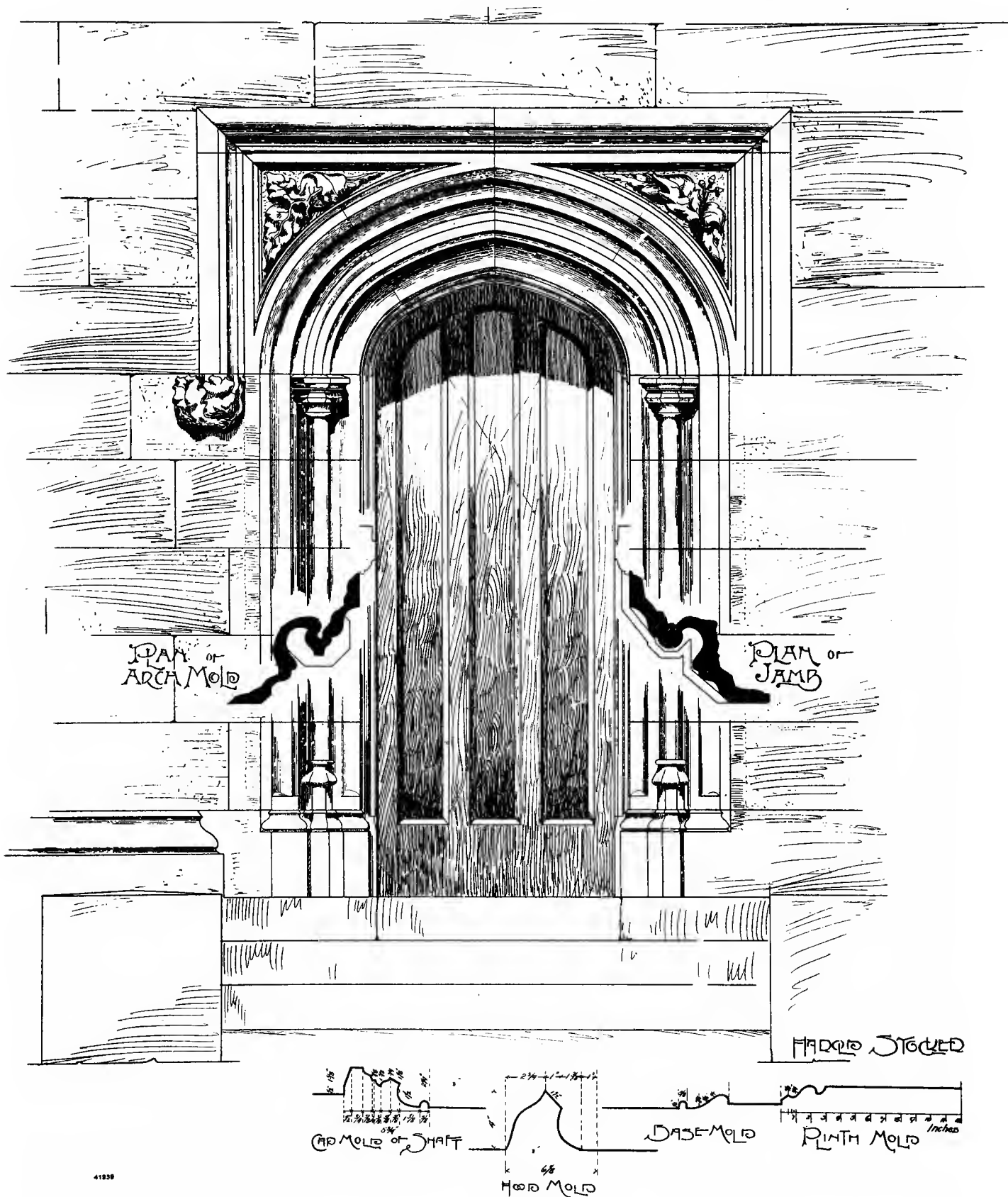
After passing through the trades course and the course in Building Construction and Styles of Architecture, the students are encouraged to come and practise the application of

GREAT HALL, SYDNEY UNIVERSITY



HALF SECTION OF ROOF, GREAT HALL, SYDNEY UNIVERSITY.
41239

TOWER DOORWAY SYDNEY UNIVERSITY.



that knowledge which they have received in the planning of buildings, but very little provision has been made so far for the development of this final course. The students who have attended the courses are rather more interested in RESEARCH WORK, and a great deal of help has been given by those students who have most successfully passed through their course in the testing and the working out of the results of the strength and other physical properties of various building materials, especially the timbers of this State, and many important contributions have been made to the Technological Museum and the Institute of Architects embodying these results.

Special mention should be made of the help given by Messrs. Farrell, Cambridge, Martin, Ansell, and Kelshaw, in the work of original research on Australian timbers, and stones, and also on reinforced concrete.

A great point is made of the necessity which exists for a student to previously study plane and solid geometrical drawing, elementary mathematics, and physics before entering on a course of studies in the Department of Architecture. In this connection it is pleasing to note that of late years the students are much better equipped for entering on the course of building and architecture than formerly. This evidently is due to the improved methods of instruction in the Public Schools.

Many students who have passed through the course have gone with a view to increasing their experience to America and England. It is interesting to note as evidence of the success of the instruction that they are doing very well. Three of these ex-students are particularly conspicuous by their success in obtaining important positions in London.

PROGRAMME OF CLASSES.

DEPARTMENT OF ARCHITECTURE.

JAMES NANGLE, F.R.A.S., F.I.A., N.S.W., Lecturer in Charge of Department.

B. HADLEY, Teacher of Drawing.

G. A. ROBERTS, N. NURZEY, E. CAMBRIDGE, Assistant Teachers of Drawing.

CONSTRUCTION DRAWING—1st and 2nd years: Monday, Tuesday, and Wednesday, 7 to 9 p.m.

ARCHITECTURAL DRAWING—1st year: Monday, Tuesday, and Wednesday, 7 to 9 p.m.

Do 2nd year: Monday, Tuesday, and Thursday, 7 to 9 p.m.

ARCHITECTURAL DESIGN—Friday, 7 to 9 p.m.

BUILDING CONSTRUCTION—Lectures, 1st year, Thursday, 7 to 8 p.m.; 2nd year, Wednesday, 7 to 8 p.m.; 3rd year, Tuesday, 7 to 8 p.m.

STYLES OF ARCHITECTURE—Lectures, 1st year, Thursday, 8 to 9 p.m.; 2nd year, Wednesday, 8 to 9 p.m.; 3rd year, Tuesday, 8 to 9 p.m.

*QUANTITY SURVEYING—F. E. Stowe, Friday, 7 to 9 p.m.

CARPENTRY AND CABINETMAKING—*ADVANCED JOINERY—

Practice and Theory—Monday, Tuesday, Thursday, and Friday, 7 to 9 p.m.; Saturday, 9.30 a.m. to 11.30 a.m. T. A. Wilkie, Teacher; E. Lockley, Assistant Teacher.

CARPENTRY—Day Classes for a limited number only; Monday to Friday, 9.30 a.m. to 12 noon, and 2 to 4 p.m. Fees—Juniors, £1 per term; Seniors, £2 per term.

*HANDRAILING AND STAIRCASING—Monday, Tuesday, Thursday, and Friday, 7 to 9 p.m.

*WOOD AND CHIP CARVING—Tuesday and Thursday, 10 a.m. to 12 noon; Monday, Wednesday, and Friday 2 to 4 p.m.; Thursday, 7 to 9 p.m.

WOOD-TURNING—Monday, Tuesday, and Friday, 7 to 9 p.m.; Miss Bannister.

BRICKLAYING—Teacher, G. Bebb; Tuesday and Friday, 7 to 9 p.m.

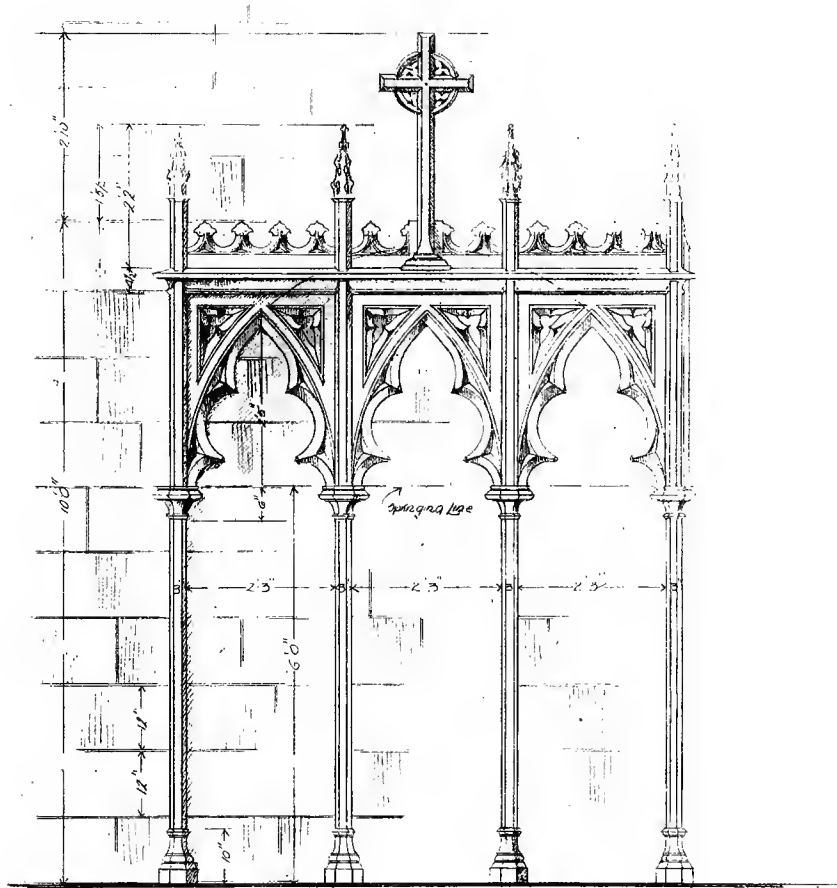
**FRENCH POLISHING AND WOOD DECORATION—E. Adames; Monday and Friday, 7 to 9 p.m.

* Fees, Senior Scale,

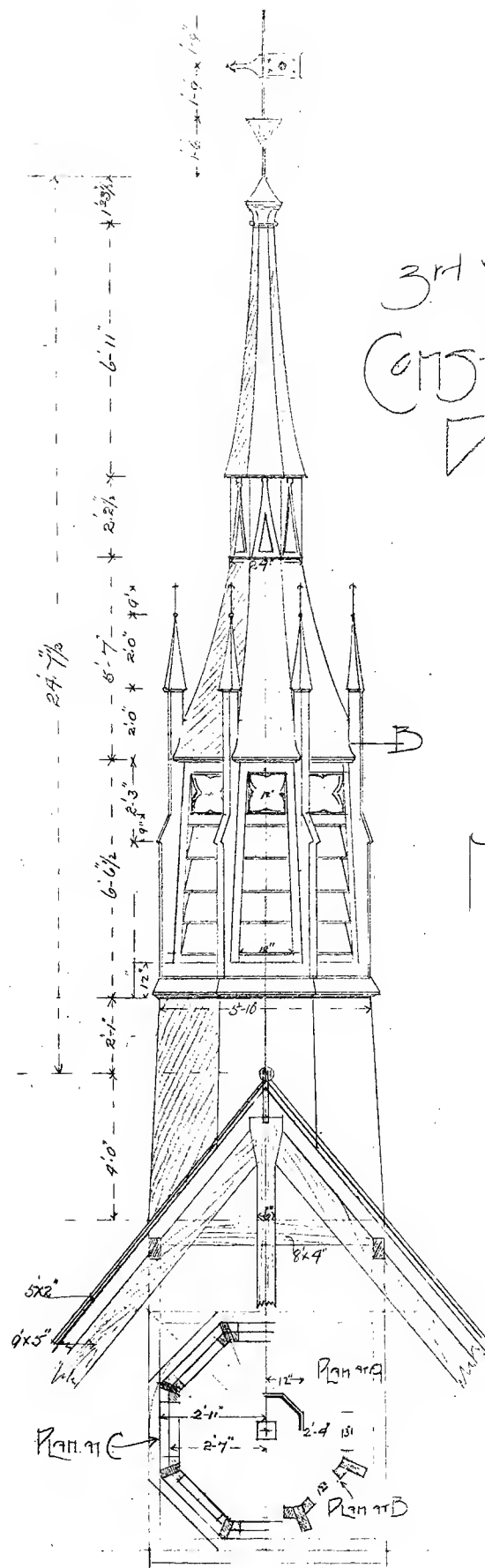
Architectural Drawing

Second Year 1908

Sketch of a Gothic Screen



Elevation of Screen



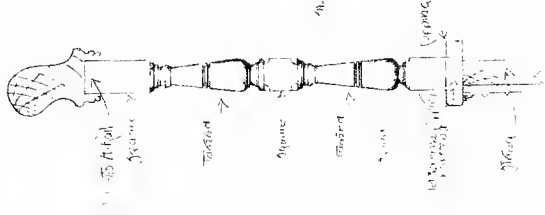
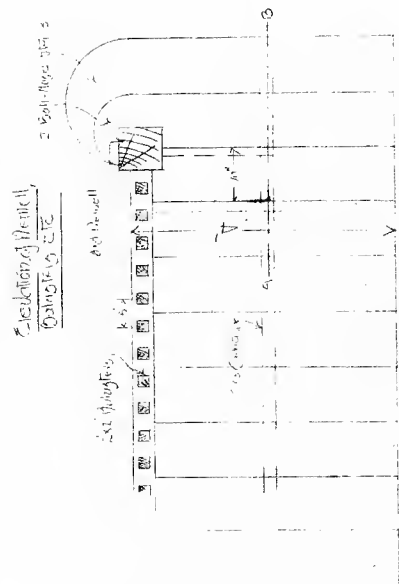
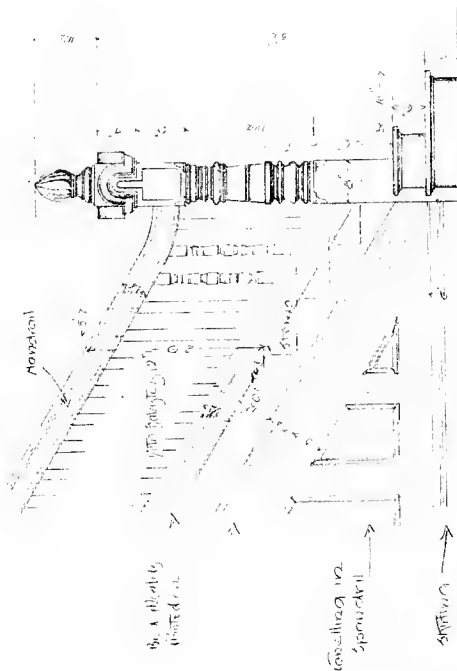
3rd YEAR
CONSTRUCTIONAL
DRAWING

No 63

Conjunction Working

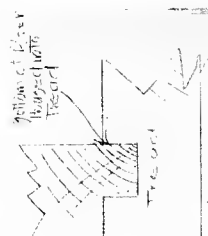
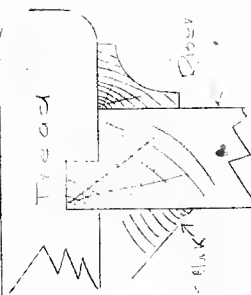
Second Year 1900

Part Plan & Elevation of a stair



Also Refer to

Changeable Method of Constructing
Rovers Tread



Changeable Method of Constructing
Rovers Tread



Changeable Method of Constructing
Rovers Tread

Changeable Method of Constructing
Rovers Tread

Department of Biology.

(By S. J. JOHNSTON, B.A. B.Sc.)

THE Department of Biology as at present constituted was formed only two years ago, though the subjects Botany and Physiology have been taught in the College for a number of years. The complete course affords a thorough training in Biological Science in the broad sense, including Botany, Zoology, and Physiology.

BOTANY.

The course in Botany covers two years' work. In the first year the work, as is found most suitable in an elementary treatment of the subject, is confined to the Higher Plants. First the general morphology of flowering plants is dealt with in considerable detail. This is followed by an examination of the tissues and minute structure of plants with practical microscopic work. The physiology of plants is then discussed, the life and work of the plant, as a whole, and the functions of the various members of the plant body. The nutrition, respiration, growth, movements, and reproduction of plants are discussed in detail, and the various aspects of plant physiology of importance in agriculture pointed out and emphasized. Many experiments on the physiology of plants are carried out in the class.



MR. S. J. JOHNSTON,
Teacher of Botany.

Finally the classification of plants is treated on, and a number of natural orders are studied. The largest and most important orders are chosen for study here, in order that the students may gain an intimate knowledge of the structure and relationships of plants commonly met with in the garden and field, and a few typical Australian natural orders as a short introduction to a knowledge of Australian plants; but the main object in choosing the orders is to teach the student about common cultivated plants, typical Australian natural orders being much more numerously treated in the second year's course. Several species of each order are chosen as types, and by means of the dissection of actual specimens a good idea of the morphology of each order is gained; in addition, the Distribution and Economics of the selected orders is studied.

Throughout the year a number of field excursions are held, where plants are studied in their natural state, and an introduction to a knowledge of Australian plants gained. This is one of the most popular and useful parts of the work.

In the second year's course the Plant Kingdom is dealt with as a whole, and the lower orders of plants as Algæ, Seaweeds, Fungi, Mosses, and Ferns are studied practically with the microscope. The histology of the vascular plants is practically studied in detail, and a know-

edge of the technique of micro-botany imparted. The methods of the preparation of plants and parts of plants for microscopic examination, the cutting of sections, the action and use of micro-chemical reagents and stains are now learned and practically carried out by the students. Finally a much larger number of natural orders than in the first year are selected for study, including a number of the most characteristic and interesting orders of Australian plants. As in the first year's course a number of field excursions are held, and students are encouraged to make and preserve collections of local plants; and using their course as an introduction to the subject, to follow out the study of Australian plants for themselves.

The work throughout is illustrated by specimens, microscopic preparations, models, diagrams and experiments.



THE BOTANY CLASS-ROOM,

Mr. S. J. Johnston lecturing to class.

The aim of the complete course is to impart a thorough knowledge of the science of Botany on modern lines, and to engender an enthusiasm for the work in the students so that they will carry it on after leaving the College, and by their work on Australian plants, add to the sum of botanical knowledge.

The students include many teachers both of State Schools and of private primary and secondary schools. Every year, too a number of practical gardeners, nurserymen, and students of agriculture are to be found in the classes, and are amongst the most attentive and enthusiastic of students.

ZOOLOGY.

This subject is also taught as a two years' course, and consists of lectures and practical classes. In the first year the student begins with the lowest forms of animal life, sees their relations with the lowest plants, and follows the gradual increase in complexity of structure throughout the animal kingdom. Classification is an important part of the classwork.

The Protozoa, Sponges, Corals, Polypes, Jelly-fish, Star-fish, Sea Urchins, parasitic and free-living Worms, Lobsters, Barnacles, Insects, Spiders, Centipedes, and Molluscs are studied practically by means of actual specimens, along with the groups to which they belong.

During the second year, the Insects, as of great economic importance in an agricultural country, are studied in much greater detail. Then follows a consideration of vertebrated animals as Fishes, Amphibians, Reptiles, Birds, and Mammals.

The students examine living pond life; they make dissections of types of the various classes and examine other specimens. They become familiar with the use of the microscope, and are taught how to mount and stain specimens as microscopic objects. An industrious student is able to form the nucleus of a good teaching collection. The mounting and preserving of insects and other animals is also a part of the work.

Those animals which are of economic importance, as parasites, pests, those used for food, or injurious to man, &c., receive special attention. Interesting life histories are dealt with; and in the senior class a brief sketch of embryology is given and various biological processes and problems explained and discussed.

A very useful part of the course is the outdoor work. Excursions are held frequently. The students study animal life along the seashore, in the pond, and in the field.

The work is well illustrated with diagrams, models, dissections, microscopic and lantern slides. This class as well as the Botany class is of special benefit to teachers who wish to gain a knowledge of nature study, and is also very useful to students of agriculture.



MR. GEORGE,
Teacher of Zoology.

PHYSIOLOGY.

The course in Physiology consists of two parts, lectures and practical work. In the lectures the broad principles of the subject receive due prominence and special attention is given to such matters as food, its composition and nutritive value; the processes of digestion, respiration, and circulation, excretion and secretion, the effect of exercise, the nervous and sensory mechanisms. The practical work follows the lecture and usually deals with the same part of the subject. To gain a knowledge of the anatomy and physiology of the various organs in the body of man, examples of these organs from various domestic animals are taken and dissected, *e.g.*, the brain and heart of a sheep, larynx of pig, eye of ox, &c. The minute structure (histology) of the body is studied under the microscope.



MR. KESTIVEN,
Teacher of Physiology.

A very important part of the work of this class is the chemical physiology. Sugars, starch, proteid, egg, milk, flour, bread, &c., are examined chemically, and experiments in artificial digestion are carried out by the students.

The teaching is illustrated by models, dissections, experiments, microscopic and lantern slides, and diagrams. There is a shorter course compulsory for students training for sanitary inspectors and meat inspectors, though many of these take the full course and are amongst the best of the students. In addition to these the classes are composed mainly of school teachers, both of private and State schools, dentists' apprentices, professional exponents of physical culture and massage, and others. All the classes of the department contain a number of general students, people interested in science and knowledge for its own sake, and in search of information and education.

EQUIPMENT.

All the classes of the Biology Department are carried on, at different times, in the same class-room, which is fitted up as a biological laboratory. While the equipment of this laboratory through lack of funds leaves much to be desired, the essential requirements are there. There are twenty benches, each designed to accommodate two students. Each bench contains a sink, with water and gas laid on. The seats are arranged on curves so as to face the teacher and blackboards in the centre. There is a large revolving screen for the display of diagrams, which are pinned on. A lantern equipment is available and is largely used. The laboratory has an adequate supply of good modern microscopes, two microtomes, bunsens, dissecting dishes, and other apparatus generally used in a laboratory of this nature.



MR. PETERSEN,
Laboratory Assistant.

PROGRAMME OF CLASSES.

DEPARTMENT OF BIOLOGY.

*BOTANY—S. J. Johnston, B.A., B.Sc.—Monday (First year), 7 to 8 p.m.; (Second year), 8 to 9.30 p.m. Saturday, 9 a.m. to 10 a.m.

*PHYSIOLOGY—H. L. Kesteven, B.Sc.—Tuesday (Lecture), 7 to 8 p.m. Practical Work, 8 to 9 p.m.

*ZOOLOGY—S. George, B.Sc.—First year—Friday (Lecture), 7 to 8 p.m. Practical, 8 to 9.30 p.m. Saturday (Lecture), 10 to 11 a.m. Practical, 11 a.m. to 12.30 p.m. Second year—Wednesday (Lecture), 7 to 8 p.m. Practical, 8 to 9.30 p.m.

* Fees, Senior Scale.

Department of Chemistry and Metallurgy.

(By W. J. CLUNIES ROSS, B.Sc., Lond., F.G.S., Lecturer in charge of Department).

THE course of instruction in this Department is intended to afford a complete training in Theoretical and Practical Chemistry to those who aspire to the position of Assayer, Metallurgist or Works Chemist, when supplemented by experience in the laboratory of a mine or chemical works. It provides also for those who, while not wishing to give sufficient time to complete their course, yet desire to acquire some knowledge of the science to improve their general education, or as subsidiary to the study of other sciences.

The Syllabus in pure chemistry consists of three courses of lectures in Theory; the first dealing with elementary principles and the chemistry of the non-metals; the second, with the chemistry of the metals and Technical Chemistry; the third, with higher theory and chemistry of the rare metals. The Practical Chemistry Course includes training in qualitative analysis, which may be completed in two years, students taking one lesson a week, but students taking two or more lessons a week may finish in one year. This is followed by quantitative analysis extending over two years, two lessons a week, dealing first with gravimetric analysis, followed by volumetric analysis, and the analysis of minerals and ores.

Examinations are held at the close of each term and at the end of the year, no student being allowed to have the complete certificate unless he has passed all his examinations successfully.

There is a course in metallurgy and assaying, theoretical and practical, extending over two years, two lessons in practical assaying per week.

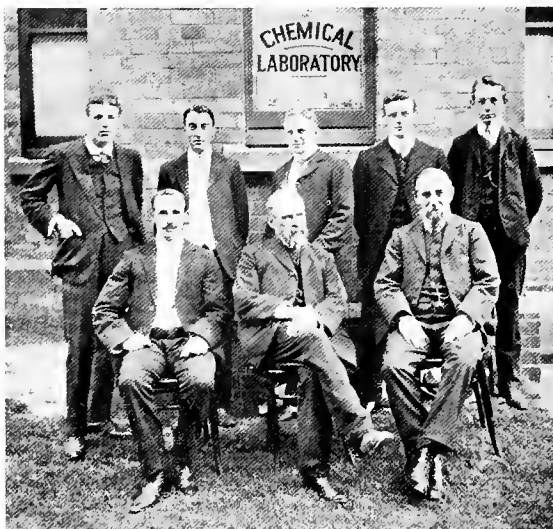
Students are not usually allowed to take up assaying until they have some knowledge of chemistry, but if pressed for time, may, with the consent of the teachers, take up the two courses simultaneously.

There is also a two-year course in Organic Chemistry, theoretical and practical, but students are required to learn Inorganic Chemistry, first year at least, before taking up Organic, unless they possess a previous knowledge of that subject.

Great care is exercised in laying the foundations of chemical knowledge, students being required to carefully record all experiments in their note-books, which are checked by the teachers, and are also trained in testing weights and balances, in calibrating measuring vessels, &c. Experience has shown that this method results in students being well able to hold their own in comparison with those trained at other centres.

The classes are open to all students, male or female, who desire to learn chemistry, provided they possess sufficient elementary education to enable them to follow the lectures, and the ages of the students now attending, range from 14 to 70.

Chemistry also forms an integral part of the day courses in Engineering, students taking Mechanical or Electrical Engineering attend the first two years of Theoretical and Practical Chemistry, also attending lectures on Metallurgy. Those who are following the course for mining engineers take Quantitative Analysis, Metallurgy, and Assaying in addition.



STAFF OF THE DEPARTMENT OF CHEMISTRY.

Reading from left to right—

Front row: Mr. Challinor, Assistant Teacher and Demonstrator;
Mr. Ross, Lecturer in charge of Department; Mr. Smith,
Lecturer in Organic Chemistry.

Back row: Messrs. Lewis, Walker, Harding, Coombs, and Murray.

Hitherto it has not been possible, except to a very limited extent, to provide for students following up systematic technical analysis, owing to lack of space. It is hoped in the future that facilities will be provided and courses arranged in such branches as the Chemistry of Tanning, of Oils and Fats, of Sugar, of Cement and Earthenware, of Agricultural Chemistry, &c.

The accommodation provided includes a lecture-room, capable of holding about 70 students; a laboratory with benches for about 40 students working at one time; a metallurgical laboratory fitted with wind and muffle furnaces; a balance room with about twenty chemical and assay balances; and a limited amount of store space, with two small rooms for the teachers, which also serve as store-rooms.



DEPARTMENT OF CHEMISTRY AND METALLURGY—LABORATORY.

The rooms are often overcrowded, and not very well lighted, so that more space is urgently required. The Committee appointed by the Public Service Board to investigate the chemical laboratories and Museums maintained by the State, reported strongly to this effect. Plans for an additional story to the present building have been prepared, and it is hoped will be carried out. Were ground space available, however, it would be far better to erect an entirely new building, so that teaching would not be interfered with while the alterations were being carried out.

The Staff consists of a Lecturer in charge of the Department, who gives the lectures on Inorganic Chemistry, teaches Practical Chemistry in part, and supervises the Department. An assistant teacher and demonstrator, Mr. R. W. Challinor, who teaches Practical Chemistry, especially quantitative analysis; a laboratory assistant, Mr. H. A. Harding; together with a junior laboratory assistant, and honorary assistant. The branch of Assaying and Metallurgy is under a teacher, Mr. A. H. Stewart, B.E., who conducts the theoretical and practical work, assisted by a demonstrator, and honorary assistant. Organic Chemistry is taught by Mr. H. G. Smith, F.C.S., at the Technological Museum.

That the Department is fulfilling the purposes for which it is designed is shown by the large and increasing number of students, and the cordial and friendly feeling which exists between teachers and students. The number of students enrolled in the classes last year, 1908, was:—

Inorganic Chemistry	...	...	...	435
Metallurgy and Assaying	...	...	...	47
Organic Chemistry	...	...	...	14
Total	...	...	...	496

This is about double the number attending five years ago.

Classes in Chemistry were started by Mr. Dixon shortly before the establishment of the Board of Technical Education, in 1883, which then took over the Chemistry Classes as part of the scheme of Technical Education. The classes were at that time held in the School of Arts, Pitt-street, under Mr. W. A. Dixon, F.I.C., F.C.S. In 1885 classes were formed at Bathurst, Newcastle, and Goulburn. Classes have been started in other centres from time to time, and at present are being held at Albury, Bathurst, Broken Hill, Cobar, Dubbo, Goulburn, Lithgow, Maitland, Newcastle, Tamworth, and Hillgrove.

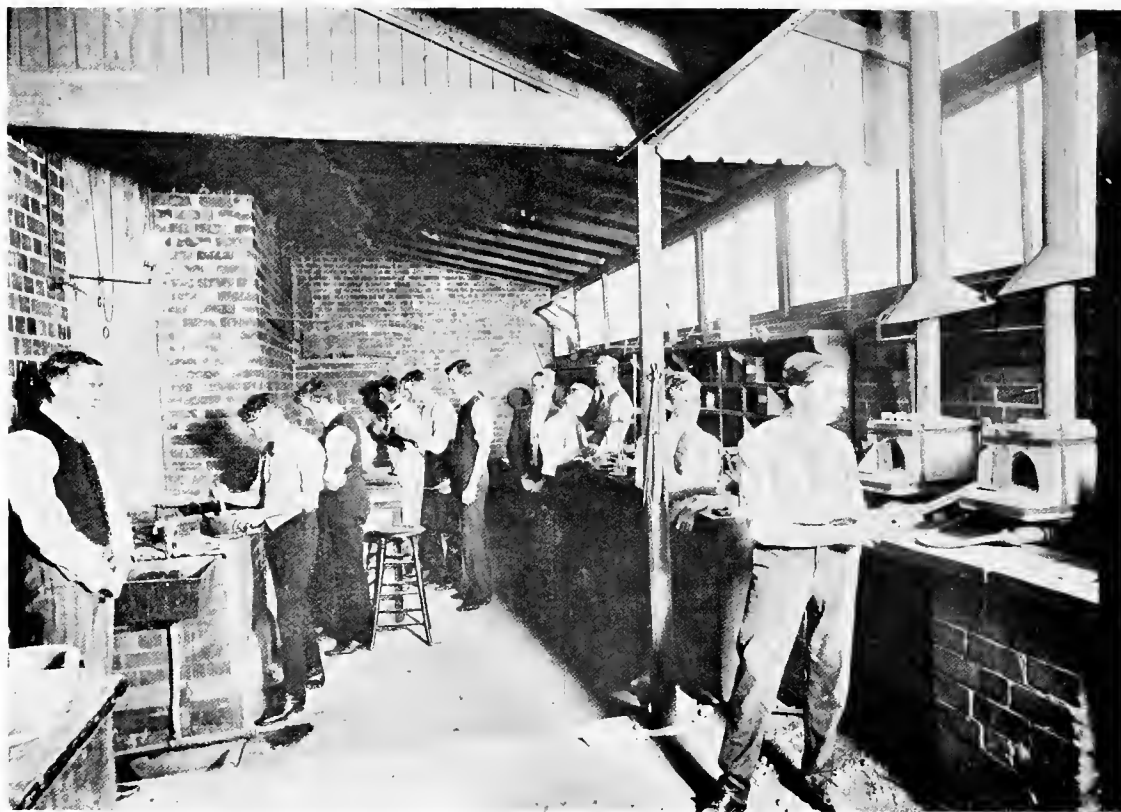
At all these centres the same course of instruction is pursued as in Sydney, and the same examination papers are worked at the Annual Examinations.

Many students who commenced their chemical studies at the Technical College are now occupying responsible positions in various parts of Australia; some also in America, and elsewhere. One does not care to mention names without the consent of those concerned, but one ex-student is Metallurgist at an important mine in the northern part of New South Wales.



THE CHEMISTRY CLASS-ROOM.

Mr. Ross lecturing to the class.



THE ASSAYING LABORATORY.

Mr. Stewart, Teacher of Assaying, &c., on the left.

Another is managing a copper-mine, also in this State. A third occupies an important position in Tasmania. Others are at work at Broken Hill, Cobar, &c.,. For the most part we lose sight of students when they leave the College, and it is only occasionally that one calls in to tell of his success. There is, however, an ex-students' union connected with the Engineering School, and at the annual dinner one meets a considerable number of former students, and hears of others, nearly all of whom are doing well.

PROGRAMME OF CLASSES.

DEPARTMENT OF CHEMISTRY AND METALLURGY.

W. J. CLUNIES ROSS, B.Sc. (Lond.), F.G.S., Lecturer in Charge of Department.

A. H. STEWART, B.E., Teacher of Metallurgy and Assaying.

R. W. CHALLINOR, Assistant Teacher and Demonstrator.

* PRACTICAL CHEMISTRY—Monday, Tuesday, and Friday, 7 to 9.30 p.m.

THEORETICAL CHEMISTRY—Monday (Third year), 7 to 8 p.m., Tuesday (Second year), 7 to 8 p.m., and Thursday (First year), 7 to 8 p.m.

* ASSAYING—Monday and Wednesday, 7 to 9.30 p.m.

* ORGANIC CHEMISTRY—H. G. Smith, F.G.S., Thursday (Second year), Friday (First year), 7 to 9.30 p.m.

METALLURGY—Thursday, 8.30 to 9.30 p.m.

DAY CLASSES.

* PRACTICAL CHEMISTRY—Monday, Wednesday, and Friday, 2 to 5 p.m.

* ASSAYING—Tuesday and Thursday, 2 to 5 p.m.

† THEORETICAL AND PRACTICAL CHEMISTRY—Saturday, 9.30 to 12 noon. Fee, £1 1s. per term.

* FEES—One Lesson per week, or 14 consecutive Lessons, £1 1s. per term.

Two " " 28 " " £1 11s. 6d. "

Three " " 42 " " £2 2s. "

† Intended specially to meet the requirements of School Teachers.

Commercial Department.

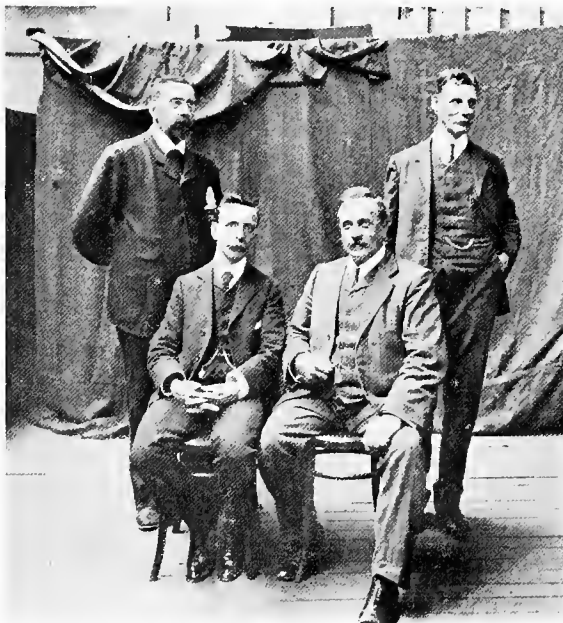
BOOK-KEEPING.

(By ALFRED ARMSTRONG, Teacher of Class.)

THE writer has been Instructor of Book-keeping at the Technical College for about twenty years, and is also Teacher at the Surry Hills and North Sydney Technical Schools. The Book-keeping Class is a popular one, and has an average nightly attendance of about fifty students, comprised principally of young men who come to the class to learn, and to improve their knowledge in this important subject of commercial education. Many business men also take advantage of the class, for, as one of our writers has said, "Book-keeping is the very key of our position, and the records of our Bankruptcy Court show us how many fortunes have been wrecked, how many growing prospects blighted, through ignorance of this vital part of commercial knowledge."

According to the records of our own Bankruptcy Court, here in New South Wales out of 123 certificates that were suspended, 99 were for failing to keep proper books of accounts: showing how very necessary it is that one should learn this essential branch of education.

Many of the students have obtained important positions in the city, whilst others have improved the position they held, through the knowledge gained at the College. It is rather a difficult matter to trace the career of the students after they have completed the course at the College, because the successful ones hold the Certificate of Merit which is sufficient recommendation for a position.



STAFF OF COMMERCIAL DEPARTMENT.

Reading from left to right—Mr. Wüst, French and German Mr. Stuart, Shorthand; Mr. Armstrong, Book-keeping; Mr. Bruce, Penmanship and Correspondence.

PENMANSHIP AND CORRESPONDENCE.

(By JAMES BRUCE, Teacher of Class.)

IN this age of specialism it is of paramount importance to those persons who earn their livelihood behind their pen, that they possess a good substantial knowledge of the art of writing, and sufficient skill with which to apply it easily, swiftly, and accurately. The speed of thirty years ago no longer meets the requirements of the business man of to-day, who demands the high rate of from thirty to thirty-five words per minute.

There can be no doubt that a good, clear, business-like handwriting has given more young men and women a start in life than any other one accomplishment. It is a qualification that speaks for itself, an ever-ready and winning testimonial, and a valuable asset to its possessor.

Good handwriting is a necessary accomplishment to all classes of society, and especially so to that class of persons engaged in business pursuits. To the youth who is leaving school and aspiring to a position in an office, it is of the utmost importance that he should write well; and, that this fact is thoroughly recognised by all who are employers of mercantile labour, is very easily seen from the advertisements in our daily papers, where, over and over again, we meet with the phrase, "Must write a good hand," as a necessary qualification for a clerkship. On the other hand the unfortunate possessor of a poor, slovenly, illegible hand has frequently found it to be a serious hindrance to promotion and a severe handicap at all times.

That writing which serves the purpose for which it is used is always the best, and judged from this standpoint there will be several styles of good writing. For instance, that style which would most become the methodical accountant might want the elastic ease desired by the correspondent or general clerk; neither style would be an acceptable substitute for the bold round hand of the policy clerk or the set formal hand of the engrosser, while all would be wanting in the finished elegance of the copy and professional writer. In a general way that writing is best which is most readily read and most easily and rapidly written.

The Penmanship Classes were established fully twenty years ago, and students (male and female) in large numbers have availed themselves of the benefits to be had from a special treatment of the subject. Clerks (Bank, Mercantile, and Public Service), Tradesmen, Warehousemen, and Teachers are all represented at the classes.

The teacher of this class has prepared an extensive series of exercises for the attainment of ease, speed, and clearness in business writing, and it is confidently claimed that with a reasonable amount of careful practice the desired result will be secured.

It may also be noted that when a certain standard has been attained by the student he is at once transferred to the correspondence section of the class, where letters of a business character have to be written on popular subjects, and treated in a businesslike manner.

FOREIGN LANGUAGES.

(By J. C. WÜST, Teacher of French and German.)

THESE classes were inaugurated in September, 1905.

Nature of Work and its Advantage to Students.—The compilation of the syllabus was prompted by the universally acknowledged fact that studying a foreign language exercises and strengthens memory; wit, acuteness, and reasoning power reach a higher plane; and as thoroughness, perseverance, and assiduity are absolutely essential to master a foreign language, the overcoming of difficulties connected with such study develops character and steels the will power.

Apart from the gain in an intellectual direction, the usefulness, from a material point of view, of having one foreign language at least at one's command is admitted throughout the world.

The introduction of steam and electricity has not only changed the outward aspect of the globe, it has done as much to the character of mankind.

Incessant expansion of international communication compels nations to foster mutual understanding—to use several languages; and such recognised need of language not only helps to acquire a wealth of words from foreign lands, it helps above all to appreciate and esteem, by comparison, the treasures and beauties of one's mother tongue. With every new language an abundance of new ideas is poured into the learner's mind, which extend his horizon.

To make oneself at home with a new language not only means to break the fetters that separate nation from nation, it means to become possessed of another nation's ideas and to be interested in its existence, to attain personally a new existence to a certain degree, to no longer know other nations by proxy,—viz., by translations and reports.

The question now arises: which of modern languages are likely to be most helpful to an Australian to reach the aforementioned object? Evidently those commanding pre-eminence in literature, science, and commerce. In this direction French and German are not playing the least important part.

Further, recognizing that the natural organ of language—the receptive one—is the ear, the second place being taken by the organs of speech, followed by the eye, and finally by the hand; provision has been made to impart instruction in that order, gradually making the four senses to co-operate.

The complete course for each of the two languages extends over three years.

First Year's Course.—The student's ear being the first to be trained, the teacher begins the course of study with a simple connected conversation, enounced and presented in the language studied. Then it is set forth in English. After a few repetitions in the language studied, the sounds and meanings of words have been sufficiently well assimilated by the learner to enable him to go through the conversation with the master. In subsequent lessons the principles and peculiarities of the language in question are treated, and writing from dictation of seen and unseen passages is practised. Grammar, essential to good speaking and writing, is taught inductively as far as practicable. Students are urged to supplement classwork by home study, and any written work handed in, is checked, and returned at the next meeting of the class.

Second Year's Course.—At this stage the student is expected to be well at home with the pronunciation, and he receives encouragement to use the language as much as possible. In other respects more advanced work is carried on, on similar lines to the First Year. For reading purposes the local newspaper, "*Le Courrier Australien*," is used for French; "*Die Sudaustralische Zeitung*," published in Adelaide, for German.

Third Year's Course.—The teacher's aim having been from the first, to render the student independent of his assistance, the theoretical portion of his work is now left entirely to the learner's own individual efforts. Composition is included in this year's course, also commercial correspondence for those who so choose. As in previous years, so also here, all written work is corrected, together with needful directions, explanations, &c. The oral work, more advanced, is presented on the same lines as in previous years.

COMMERCIAL DEPARTMENT.

BOOK-KEEPING—A. Armstrong, Wednesday, 7 to 8 and 8 to 9 p.m. Fees, Senior Scale.

PENMANSHIP AND CORRESPONDENCE (Public Service and Business styles)—James Bruce, Wednesday, 3.30 to 4.30, 7 to 8, and 8 to 9 p.m.; Saturday, 10 a.m. (if sufficient students enrol). Fees— 10s. 6d. per term for one Lesson per week, and 16s. for two lessons.

SHORTHAND—William C. Stuart, Tuesday and Friday, 7 to 8, and 8 to 9 p.m. Fees, 10s. 6d. per term for one Lesson per week, and 15s. for two Lessons.

FRENCH—J. C. Wüst, First Year, Thursday, 7 to 9; Second Year, Tuesday, 7 to 9 p.m. Teachers' Course, Saturday, 10.30 a.m. to 12 noon. Fee, 10s. per term.

GERMAN—J. C. Wüst, First Year, Friday, 7 to 9 p.m.; Second Year, Wednesday, 7 to 9 p.m. Teachers' Course, Saturday, 9 to 10.30 p.m. Fee, 10s. per term.

ITALIAN—G. Tenderini, Thursday, 7 to 9 p.m. Fee, 10s. per term.

Department of Domestic Economy.

(By MISS A. M. MONRO, Teacher in charge of Department.)

NATURE AND ADVANTAGES OF THE WORK.—The nature of the work done under the Department of Domestic Economy is made as far-reaching as possible, in all its branches, because there

can be no doubt it is one of the most important sections of woman's work.



STAFF OF THE DEPARTMENT OF DOMESTIC ECONOMY.

Seated—Miss Monro (Teacher in charge of Department).

Standing from left to right—Miss Jones (Teacher of Cookery); Miss Gentles and Miss Wines (Assistant Teachers of Cookery and Domestic Science); Mrs. Nicholls (Teacher of Laundry and Domestic Science).

The aim of the Department is to improve the status and conditions of domestic work, and to give to all classes of students a scientific and technical training, not only in the care of the house, and in household arrangements, but in the practical care of the sick, and the rearing of the young. To improve the conditions of hired labour in the direction of rendering them more effective in the care of the health and wellbeing of the household.

The classes and courses of instruction are arranged and graduated with the object of meeting the requirements of all classes of the community, and may be subdivided as follows:—

DOMESTIC SCIENCE, THEORETICAL AND PRACTICAL, is divided into two sections, elementary and advanced.

The first section embraces instruction in elementary physiology, value of foods and their nourishing constituents, their adulteration, the effect of heat and the object of cooking; dietary; general principles of cookery. Housework in all its branches; housekeeping, and menu arrangement.

The second section embraces an elaboration of the subjects treated in first section in conjunction with instruction in home nursing, first aid, hygiene, and the care of infants. This course may be completed in one year by attending two lessons each week, but the ordinary course of one lesson per week involves two years' attendance, in order to obtain the full certificate.

Students in this subject desirous of obtaining a very thorough knowledge of the various branches of the practical work associated with Domestic Science may attend two or three lessons weekly.

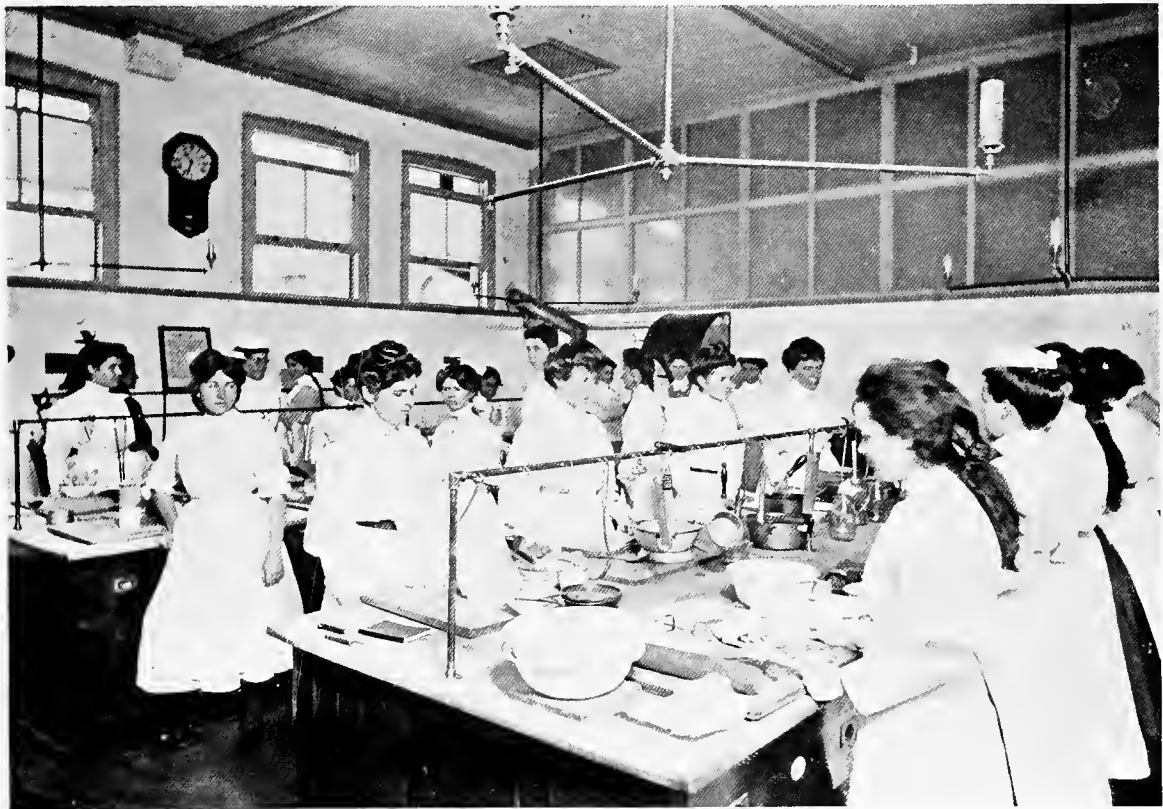
LAUNDRY WORK.—This course of lessons, which includes both theory and practice, extends over one year. The scope of the work is as follows:—The preparation and care of the laundry; practice in washing and sorting white clothes, flannels, blankets, coloured clothes,

silks and laces; making of boiled starch, ironing of articles "boiled starched"; raw starching and ironing shirts and collars, polishing of fronts, curling of collars; practice in the higher branches of ironing, as, goffering and crimping.

This course is of great advantage to students in that it gives practice in all classes of household laundry work, including the more advanced branches, such as the laundering of lace, silk, &c.

The theory is made consecutive with each lesson, so that at the end of the course a thorough knowledge of the work is assured.

PLAIN COOKERY.—This course also is theoretical and practical. It includes instruction in scullery work, the management of stoves, of the kitchen, and of the pantry; Rules for



ONE OF THE THREE KITCHENS—STUDENTS AND TRAINEES AT WORK.

NOTE.—The trainees wear caps.

roasting, baking, boiling, braising, frying, soup-making, vegetable cookery, pastry and cake making, puddings, sauces (sweet and savoury), cold-meat cookery, breakfast cookery, salad making, and invalid cookery.

This course includes all dishes used in ordinary cottage cookery, and may be completed in one year.

A certificate is issued to such as show proficiency in both written and practical work at the examinations, and an attendance during at least three terms is necessary to obtain sufficient marks to qualify for this certificate.

Practice may be taken daily at the College (Thursday and Saturday excepted), and a special evening class (theoretical and practical) has been formed for those who cannot attend the day classes, the fee being specially reduced to meet the requirements of such students.

ADVANCED COOKERY.—The advanced cookery training includes instruction in the preparation and service of dishes in the higher branches of cookery, such as:—Hors d'Œuvres, Soups, Stocks, Consommées, Purées; Dressed Fish and Fish entrées; Sauces (savoury meat, fish, sweet, and stock); Entrées; Game and Poultry: trussing, boning, larding and cooking of poultry; Entremets, sweet and savoury; Sweets, soufflés, omelettes, jellies, creams; Pastry, puff pastry; Dressed Vegetables and Salads, Supper dishes and savouries; Garnishes, Farces, &c.; Fancy cakes, large cakes and icing.

This course can be taken only by those who hold a certificate for plain cookery, or who satisfy the teacher that they have a sufficient knowledge of "plain" cookery to justify them undertaking the "advanced."

Students are required to provide the materials needed for the advanced cookery. These may be purchased at the College, and the food when prepared becomes the property of the student.

Students who have gone through the full course in Domestic Science and Cookery, *i.e.*, Elementary and Advanced, Theoretical and Practical Cookery, and who have obtained their full certificates, may then sit for the Entrance examination to the Training school for Teachers of Cookery and Domestic Science.

A number of students holding these full certificates have taken up this work privately, teaching and lecturing in many Ladies' Colleges, Nursing Homes, Charitable Institutions, and Girls' Clubs. Others are following this branch practically, taking engagements for the preparation of Dinners, Suppers, Luncheons, &c., and in many cases finding it a lucrative employment.

The students who have qualified and trained the requisite time in this school already number twenty. These have taken up duty in country districts which have been allotted to them, opening up two and three teaching centres in each district, thus it can easily be seen that the scope of the work is becoming much more extensive. There are at present a further number of students, who have shown the necessary qualifications, undergoing the training prescribed for such positions.

A special class has also been arranged for a number of the students from the Teachers' Training College at Blackfriars. These attend one and a half days per week for practice and demonstration in elementary cookery, domestic science, and laundry work, the object being to enable them to teach these important subjects theoretically in places where the facilities for practical work are not yet available in the Public Schools.

SPECIAL INSTRUCTION.—Students desirous of qualifying for positions as cooks, are as a rule, allowed to attend daily, until they have received sufficient instruction, a testimonial as to their fitness for the position being given when justified and necessary. A special course in Invalid Cookery is also provided for students who desire to obtain the certificate which, under the rules of the Australian Trained Nurses' Association, it is necessary a trained nurse should hold. This course may extend over but a brief period of time, provided that the required number of lessons is made up by daily attendance. This course has been found of great assistance to country nurses, enabling them as it does to obtain their certificates in some cases by less than six weeks' attendance at the College.

A course of four lessons in starching, ironing, polishing shirts, and curling of collars, &c., may also be taken.

Special practical lessons and short courses may also be arranged for in the following:—Garnishes, ornamental icing, confectionery, preserving, jam and pickle making, table arrangement; Decoration: service and menu arrangement.

CLASS-ROOMS AND EQUIPMENT.—The Department of Domestic Economy occupies one of the wings of the Technical College.

It is housed in a new building specially constructed and furnished with regard to the work carried on.

The building comprises a ground and a first floor. On the ground floor are:—The laundry, practising kitchen for school children, lavatories, lumber room, and the heat generator in connection with the hotwater supply system, which is installed throughout the whole building.



THE LAUNDRY—STUDENTS AND TRAINEES AT WORK.

The laundry, illustrated on this page, is a large airy room with a concrete floor, and is fitted with all the most modern appliances for the reduction of labour.

The fixed tubs are of marble slabs, and have hot and cold water taps above each division. These tubs have been found to be much more serviceable than the galvanized-iron ones commonly used, as there is no danger of damage to the clothes from iron rust.

The copper or boiler is heated by means of gas, as is also a press for indoor drying, which is used when the weather is not suitable for drying out of doors. This is a large enclosure about 6 feet high, 8 feet broad, and $1\frac{1}{2}$ feet wide, lined throughout with galvanized-iron, from which the heat is radiated on to articles which are suspended on rods in the press. These rods are fastened into the two ends of the press, which slide out, so enabling clothes to be inserted or removed from either end without difficulty.

The iron-heating stove plate, which is also heated by gas, is another great convenience, allowing about twenty irons to be heated at once. The top is enclosed by means of an iron plate thus preventing the irons from becoming blackened by the heating flame below.

There are three large tables capable of accommodating at least twelve students each, these are fitted with drawers and shelves, in which are kept iron holders, stands for skirt boards, safety pins, &c.

There is also a large number of airing stands, some of which are attached to the walls, and have numerous lever arms which fold up against the wall, out of the way when not in use.

A mangle, a washing-board fitted with a sheet of corrugated glass instead of the ordinary corrugated wood, and a large cupboard containing all laundry requisites, completes the equipment of this room.

The practising kitchen for school children is at present rather limited in accommodation, only allowing places for ten children. It is intended to increase this accommodation very shortly, as the work carried on here forms a most important factor in the training of the student teachers.

At the top of the first flight of stairs is the students' and "Trainees'" dressing room. This is a large room fitted with a numbered locker for the use of each student; thus preventing property from going astray or being lost. Mirrors and washbasins are also provided.

On the first floor are the kitchens, sculleries, pantries, larders, dining-room, model bedroom, lecture and demonstration room, and the office of the Principal.



THE LARGE DINING ROOM—TRAINEES WAITING.

The dining-room is a very large room well-lighted by a number of windows, the walls being coloured a very pretty tint of green, and having many beautiful views of Australian and Continental scenery. This room is furnished with a number of dining tables which accommodate fifty to sixty diners daily, sideboard, dinner waggon, &c. This furniture gives the students in Domestic Science plenty of practical practice.

The kitchens, illustrated on page 185, are three in number, two small, and one large; the smaller kitchens furnish accommodation for about ten students. The walls present a very fresh and clean appearance, being lined with white glazed tiles.

The tables are fitted with drawers and lockers for the utensils, &c., required by the student, each one being uniform as to fitting and furnishing and each provided with a lock and key.

A brass rod running the full length of each table, and raised about a foot above it, is fitted with hooks on which are hung the various small utensils requisite for cookery, such as whisks, strainers, measures, &c.

In the small kitchens gas cookers only are provided, but in the large kitchen—which accommodates twenty students—there are six gas stoves and one large wood and coal range, so that the students get practical experience in the use of both.

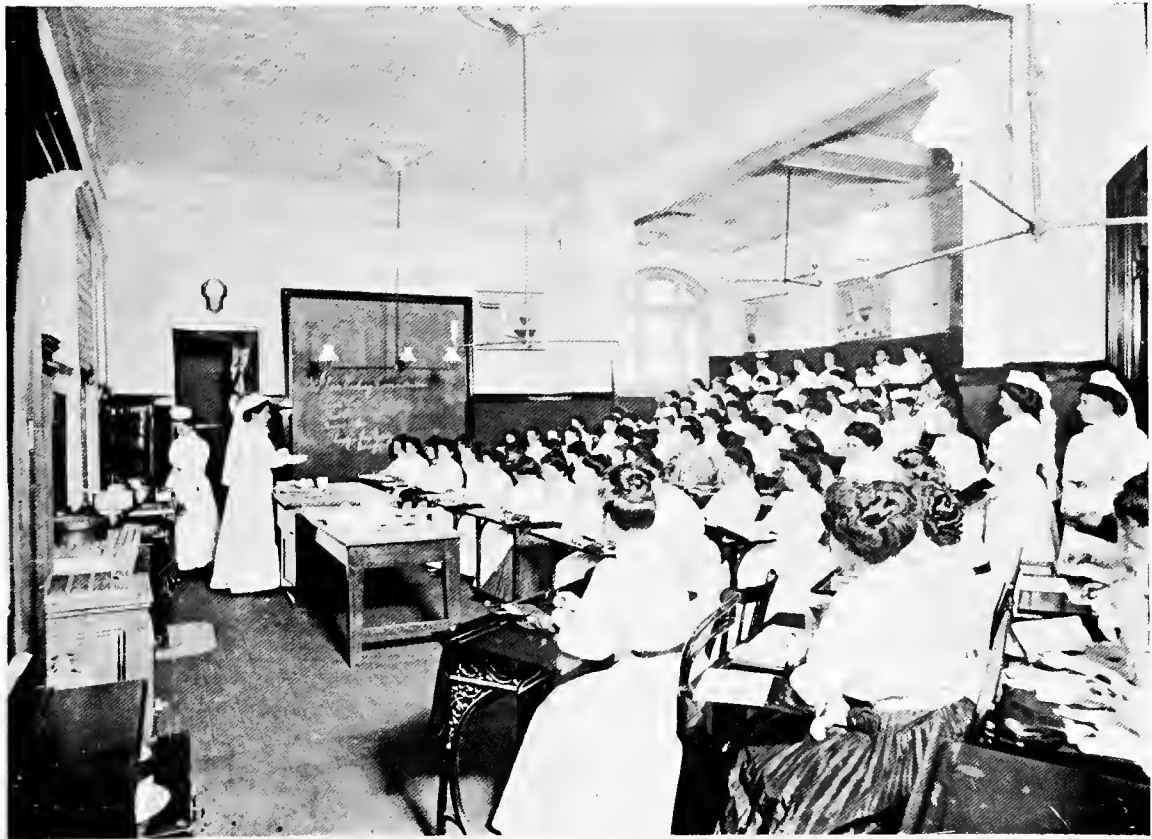
A pantry is attached to each kitchen.

The scullery extends the whole length of the three kitchens, and is fitted with shelves and cupboards for saucepans, kneeling pads, &c. The sinks also extend the length of this room, and each one has a draining board fitted to it; hot and cold water being also laid on to each sink.

The floors of all these rooms are covered with a thick linoleum, which is a great comfort to the students, not being so tiring as the uncovered floor.

The model bedroom is a medium-sized room, furnished in dark walnut, the floor being stained a light mahogany, with the centre covered with a carpet square of red. The bedstead of iron and brass is in the Italian style, and neatly draped, and the occasional table, the washstand and the dressing table are provided with the usual and suitable ornaments, in order to teach the students the artistic arrangement desirable in such a room.

This room gives the Domestic Science students full practice in nearly all the branches of household cleaning, which is further supplemented by the practice obtained in the cleaning of the dining-room, office, kitchen, and laundry.



THE DEMONSTRATION AND LECTURE ROOM.

Mrs. Nicholls Demonstrating to the Students.

Next to the model bedroom is the demonstration and lecture room, an illustration of which is given here. This is a very large room, fitted with desks each capable of accommodating two persons; these are arranged in tiers, so that those sitting at the back of the class are able

to see clearly. This room gives seating accommodation for 100 students, and is also fitted with a gas cooker, demonstration table, cupboards, and sink with hot and cold water. On the walls are hung many charts illustrative of the relative values of foods and the approximate quantity of nutriment contained in each.

A great advantage to the students and teacher alike are the wall blackboards, shown in the illustration.

The office is the last room on the first floor, and is a very compact room, furnished with a desk, a bookcase filled with books of reference, &c., and a press for forms and documents. The walls are hung with coloured prints, copies of the masterpieces of many famous artists.

This room serves a double purpose, being frequently used as a small dining-room to give students special lessons in the practice of the higher branches of table arrangement and decoration, and table waiting. The accommodation being sufficient for twelve diners only, so gives the students a great chance for original and artistic design, and enables the teacher to supervise and instruct as to the "waiting" in a manner impossible in the large dining-room with its inevitable hurry.

The attendance at all classes has within the last two or three years more than doubled. In some of the classes the number of intending students wishing to avail themselves of the instruction cannot be accommodated, testifying to the growing popularity of these branches of woman's work.

Some of the students who have gained positions as Teachers on the instruction received at this College are as follows:—Miss Sandes, Superintendent, School of Domestic Economy, Melbourne; Miss Jones, Teacher of Cookery, Sydney Technical College; Mrs. Iredale, Teacher of Cookery and Domestic Science, Goulburn Technical College; Miss Dutton, Teacher of Cookery and Domestic Science, Broken Hill Technical College; Miss Cain, Teacher of Cookery and Domestic Science, Dubbo and Wellington; Mrs. Nicholls, Teacher of Laundry and Domestic Science, Sydney Technical College; Miss Wines, Assistant Teacher of Cookery and Domestic Science, Sydney Technical College; Miss Gentles, Teacher of Cookery and Domestic Science, Bulli, Woonona, and Corrimal; Miss MacRae, Teacher of Cookery and Domestic Science, Kiama, Wollongong, and Nowra; Miss Rowell, Teacher of Cookery and Domestic Science, Bathurst; Miss Cooper, Teacher of Cookery and Domestic Science, Newtown; Miss Feakes, Teacher of Cookery and Domestic Science, Newcastle; Miss Dettman, Teacher of Cookery and Domestic Science, Wagga and Junee; Miss Harriott, Teacher of Invalid Cookery, Women's Hospital, Paddington; Miss Douglas, Teacher of Cookery and Domestic Science, Cootamundra and Young; Miss McTavish, Teacher of Cookery and Domestic Science, Tamworth Centre; Miss Degotardi, Teacher of Cookery and Domestic Science, Orange Centre; Miss Fullford, Teacher of Cookery and Domestic Science, Singleton Centre; Miss Davison, Teacher of Cookery and Domestic Science, Parkes Centre.

PROGRAMME OF CLASSES.

DEPARTMENT OF DOMESTIC ECONOMY.

Miss A. M. MONRO, Teacher in Charge.

COOKERY (Plain)—"Demonstration" Classes, Tuesday and Wednesday, 2 to 3 p.m.; "Practice" Classes Monday, Tuesday, Wednesday, and Friday, 9.30 a.m. to 12.30 p.m.

COOKERY (Advanced)—"Demonstration" Class, Thursday, 2.30 to 4 p.m.; "Practice" Class, Thursday, 9.30 a.m. to 1.30 p.m.

NOTE.—Students for the Practice Classes must also attend the Demonstration Class

FEES—(Plain) "Demonstration," 10s. 6d. per term for one Lesson per week.

with "Practice," £1 1s. per term.

„ (Advanced) "Demonstration," £1 1s. per term for one Lesson per week.

with "Practice," £2 2s. per term.

NOTE.—Practice Students in Advanced Cookery will provide the more expensive materials themselves; ordinary storeroom materials only will be found.

COOKERY—Evening Class, Demonstration, Thursday, 7.15 to 8.15 p.m. Practice, 6.30 p.m. to 9 p.m. every fourth Thursday. Fee, 8s. per term.

STARCHING AND IRONING—Wednesday, 2.30 to 3.30 p.m. Fees, 10s. 6d. per term.

DOMESTIC ECONOMY—Monday, Lecture, 2.30 to 3.30 p.m. Fees, Senior Scale.

PRACTICAL LAUNDRY—Monday, Tuesday, and Wednesday, 9.30 a.m., 1.30 p.m.

PRACTICAL DOMESTIC SCIENCE—Monday, Wednesday, and Friday, 10 a.m., 1.30 p.m.; Friday Afternoon, 2 to 4 p.m.

Department of Electrical Engineering and Physics.

(By R. C. SIMPSON, A.K.A., Am. Inst. E.E., Assoc. Am. I.E.E.,
Lecturer in charge of the Department).

SINCE the year 1904 Electrical Engineering and Physics have formed one Department. This department is at present located at both ends of the ground-floor of the main building, but it is probable that before long the Electrical Engineering Laboratories will be accommodated close to the present Physical Laboratory.

The space now occupied includes the Physical and Electrical Engineering Laboratories, a Dynamo Room, and a Battery Room.

The present day and evening courses in Physics are arranged primarily for the benefit of those wishing to follow up the Electrical Engineering Course. They are, however, of a nature likely to be useful to anyone.

The early part of the year is devoted to Mechanics, Statics, and Dynamics, treated as an experimental subject, that the students may deal first with things that can be seen and felt, before proceeding to less tangible subjects of study.

The experiments performed in the Laboratory include measurement of length, mass, time, and the use of the vernier, micrometer balance, &c.

Also experiments with levers, pendulums, &c., and on such things as the triangle of forces, centrifugal force, moment of inertia, centre of gravity, friction, &c. Then the properties of matter and hydrostatics and pneumatics are gone into.

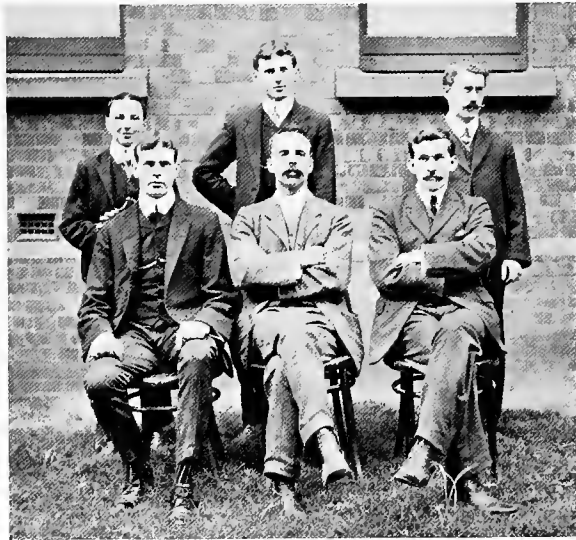
After this there is a short course on heat, light, and sound, most of which is devoted to heat, including thermometers, pyrometers, Charles's law, absolute zero, the unit quantity of heat, &c.

In the third term there is an elementary course in magnetism and electricity, in which the general facts of magnetism and current electricity are gone into, and a short time is also devoted to electrostatics.

In addition to this general course, there is a special one for Public School Teachers on Saturday mornings.

There are no advanced classes in Physics at present, but one might be formed if students presented themselves.

In Electrical Engineering the student spends the first year in studying the electrical and magnetic units and quantities, and making measurements in them, thus gaining a familiarity with these intangible things which is very necessary for an electrical engineer.



**STAFF OF THE DEPARTMENT OF ELECTRICAL
ENGINEERING.**

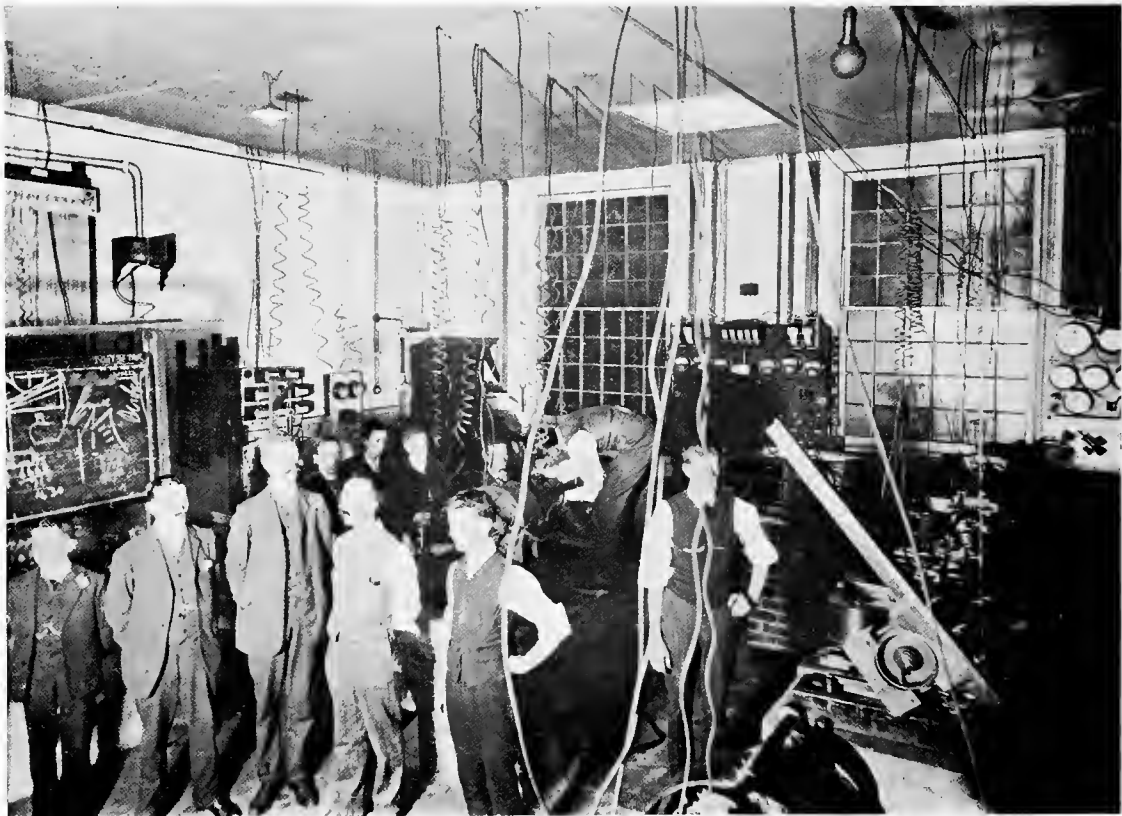
Reading from left to right—

Front row: Mr. McKern, Teacher; Mr. Simpson, Lecturer in charge of the Department; Mr. Morris, Teacher of Physics.

Back row: Mr. Lloyd, Laboratory Attendant; Mr. McDonald, Assistant Teacher; Mr. Hill, Electrical Assistant.

The day students, and the evening students also, as far as their limited time will allow, take part in the construction of simple forms of apparatus, the calibration of commercial instruments, fitting up of switchboards, &c.

In the second year the direct-current dynamo is studied from the theoretical point of view, practical tests are made to confirm the results arrived at theoretically, and efficiency and other commercial tests are also tried.



THE DYNAMO ROOM WITH LECTURER TEACHERS, AND STUDENTS.

In the third year there is a course in alternate current working and alternate current machinery.

There is also a one-year course for electrical wiremen.

The equipment of this department is arranged to be suitable for the above classes.

In the dynamo room are,—a ten h.-p. motor, driven from the Ultimo Power House, as a source of power; a three-phase alternator with exciter; a pair of rotary converters; a three-phase motor, and a single-phase motor, beside several old dynamos, transformers, &c. Each machine has its own switchboard, which has been fitted up by the day students with instruments, switches, &c.

There is a battery of fifty-six storage cells connected to a large slate distributing board.

Other apparatus includes a Siemens and Halské oscillograph, a Kelvin watt balance, potentiometers, standard cells, &c.



THE PHYSICAL AND ELECTRICAL ENGINEERING LABORATORY: STUDENTS AT WORK.

PROGRAMME OF CLASSES.

DEPARTMENT OF ELECTRICAL ENGINEERING AND PHYSICS.

R. C. SIMPSON, A.K.C., A.M. Inst. E.E., Assoc. Am. I.E.E., Lecturer in Charge of Department.
A. H. SPROULE, Assistant.

Teacher of Physics—L. C. MORRIS (P. N. Russell Scholar).

FIRST YEAR—ELECTRICAL ENGINEERING—

*Practical Classes, Monday, Thursday, 7 to 9 p.m.; and First and Second Terms, Friday, 7 to 9 p.m.

Lecture—Wednesday, 7 to 8 p.m.

SECOND YEAR—ELECTRICAL ENGINEERING—

Lecture, Monday, 8.15 to 9.15 p.m.; *Practical Class, Tuesday, 7 to 9 p.m.

THIRD YEAR—ELECTRICAL ENGINEERING—

Lecture—Wednesday, 8.15 to 9.15 p.m. *Practical Class—Tuesday, 7 to 9 p.m.

(If sufficient Students enrol.)

*Senior scale of fees is charged for Practical Class; the reduction as shown in Scale does not apply.

NOTE.—A knowledge of Physics and Algebra are essential qualifications for admission to this Department. For particulars of Physics classes see below.

ELECTRICAL WIRING—LECTURE—Tuesday, 7 to 8 p.m.

PRACTICE—Friday, 7 to 9 p.m. (Third Term only).

PHYSICS—LECTURE CLASSES—Tuesday and Thursday, 8 to 9 p.m.

LABORATORY WORK—Monday and Wednesday, 7 to 9 p.m.

Fees—Juniors, 16s. per term for two lectures and one practical class.

Seniors, 24s. "

NOTE.—Attendance at two Lectures and one Laboratory Lesson per week is compulsory.

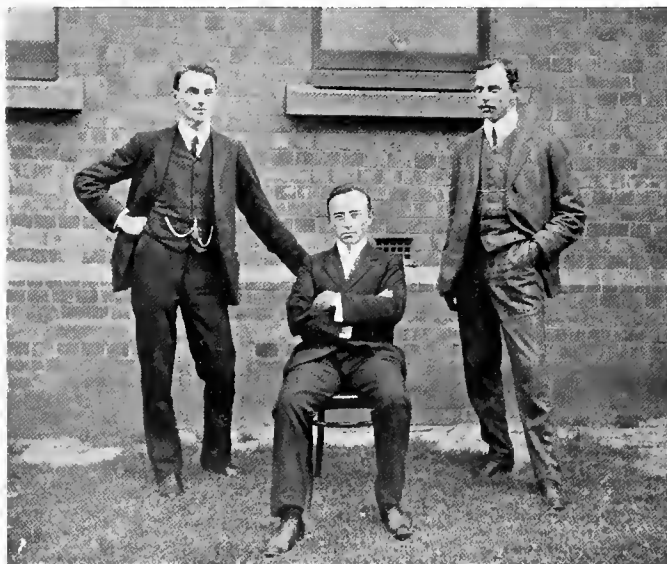
An elementary knowledge of Algebra is essential in this class.

THEORETICAL AND PRACTICAL PHYSICS—For Public School Teachers only, Saturday, 9.30 a.m. to 12 noon.

Fee, 16s. per term.

Department of Geology, Mineralogy, and Mining.

(By C. A. SÜSSMILCH, F.G.S., Lecturer in Charge of Department.)



STAFF OF DEPARTMENT OF GEOLOGY, MINERALOGY, AND MINING.

Reading from left to right—

Mr. Hammond, Assistant Teacher; Mr. Süssmilch, Lecturer-in-charge of Department; Mr. Stone, Assistant Teacher.

THIS department is situated on the first floor of the main building in Rooms 12 and 13. The lecture-room (No. 12) has accommodation for seventy (70) students, and is fitted with all the conveniences necessary for Modern Science lectures. The large room adjoining (No. 13) is used for the practical classes, and has accommodation for as many as fifty (50) students at one time. It has been specially fitted up for the practical work undertaken in this department, and is well lighted—an important consideration for these classes. In it are housed the extensive collections, numbering over 5,000 specimens, made use of by the geology and mineralogy students.

Adjoining this room is the lecturer's private room, and a workroom in which are placed the rock-grinding and rock-cutting machines for making microscope sections.

The classes at present in operation in this department, with the enrolments of students for 1908, are as follows:—

Geology—Lectures (3-years' course)	...	...	...	106
„ Practical Class (3-years' course)	...	...	...	88
Mineralogy—Lectures (2-years' course)	...	...	...	32
„ Practical Classes (2-years' course)	...	...	...	28
Metalliferous Mining (1-year's course)	...	...	...	10
Economic Geology (1-year's course)	...	...	...	0
Ore Dressing (1-year's course)	...	...	...	0
Surveying (2-years' course)	...	...	...	0
Total enrolments for 1908	...	...	...	264

The last three of these classes are being inaugurated during the current year.

GEOLOGY CLASSES.—The course of instruction is spread over three years, and is arranged to suit the requirements of those students taking the diploma courses, such as Geology, Mineralogy, Mining, Metallurgy, Agriculture, &c. In addition, the classes are largely attended by school-teachers, surveyors, and others. The lectures are well illustrated by lantern slides,

models, diagrams, maps, specimens, &c. A special feature is made of the practical classes, in which systematic instruction is given on the determination of rocks, minerals, and fossils,



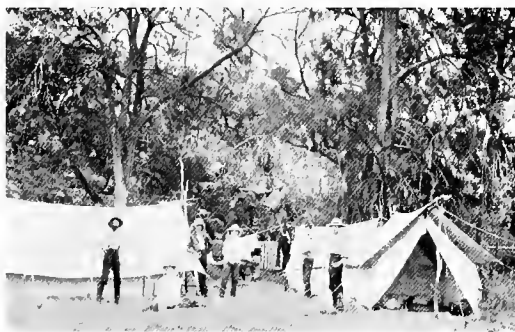
THE GEOLOGY CLASS-ROOM.

Mr. Stüsmileh lecturing to Class.

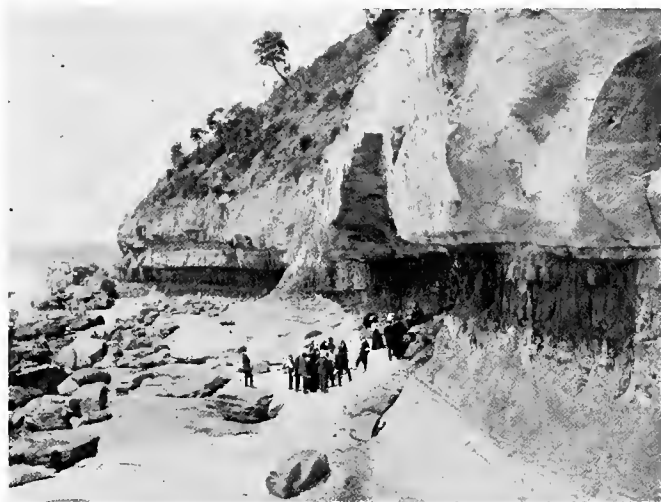
a large collection of which are available for the students to handle. In the advanced classes, microscopes (of which there are five available) are largely used, both in the Petrological and Palæontological branches. Practical instruction is also provided for in the preparation of geological maps and sections.

This practical instruction in the laboratory is supplemented by field excursions, varying from a half-day to as much as a week in length; held at frequent intervals during the year. The localities visited last year included Canobolas Mountains (seven days), Jenolan Caves and Kanimbla Valley (five days), Kiama and District (three days), Paterson (three days), Coalcliff, Narrabeen, Bondi, Nepean River, &c. These excursions are always well attended, and are very popular with the students—women as well as men.

ECONOMIC GEOLOGY.—This class is intended primarily for students taking the Mining Diploma course. The lectures deal fully with ore-deposits—their nature, classification, and genesis; and the study of the various geological problems connected therewith. ¶



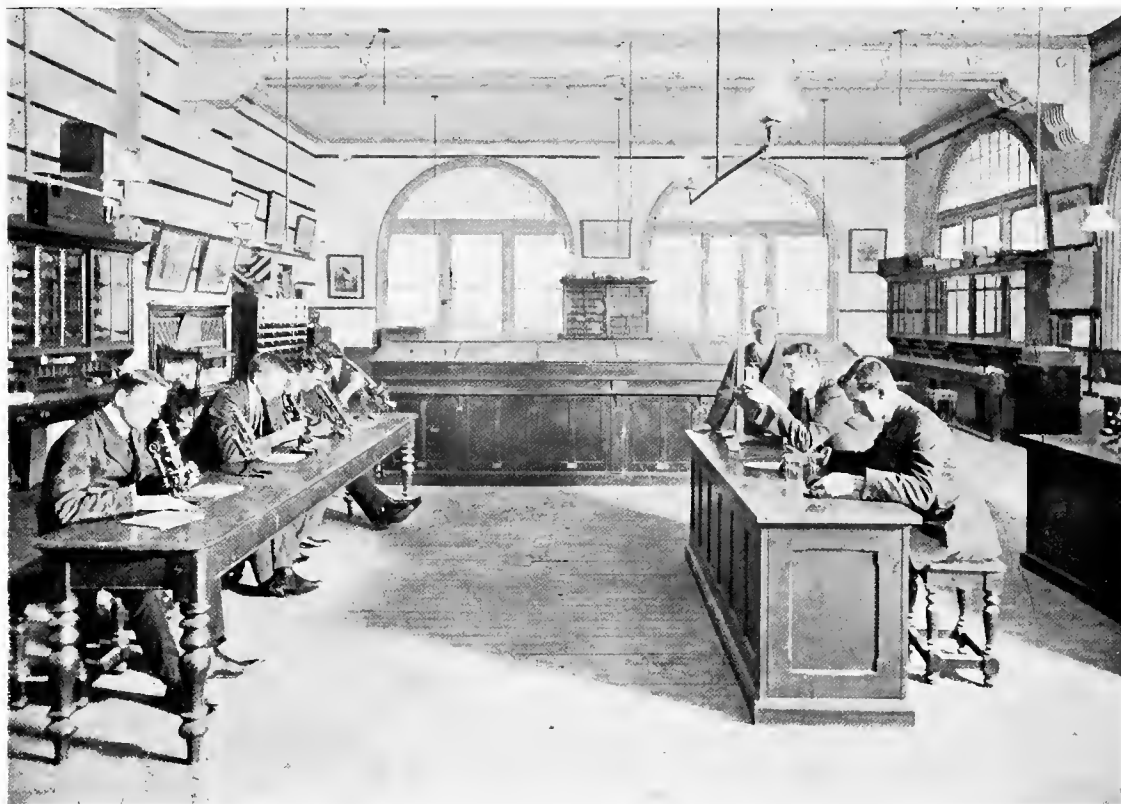
GEOLOGY STUDENTS IN CAMP NEAR MOLONG.



GEOLOGY CLASS AT CLIFTON.

and the special instruments required—such as the refractometer, polariscope, dichroscope, specific gravity balances, &c., are available for use by the students.

MINERALOGY CLASSES.—This course is spread over two years, and is taken by students qualifying for the diploma courses in Mineralogy, Geology, Mining, Metallurgy, Chemistry, &c. The course is made as practical as possible, the student being taught to determine minerals by their physical, chemical, and optical characters. A portion of the geological laboratory is specially fitted up for this work, and a considerable equipment of apparatus and material provided. In addition, a collection of about 1,000 minerals is available for handling, while the fine collection in the adjoining Technological Museum is available for lecture demonstration. The determination of gemstones is also provided for,



THE GEOLOGICAL AND MINERALOGICAL LABORATORY AND TEACHING MUSEUM
Students at Work.

METALLIFEROUS MINING.—This is a one-year's course of lectures, and is now to be supplemented by a separate course of lectures on Ore-dressing. As there is no space available at the College for a Mining Laboratory, no practical instruction can be given, but students receive a good grounding in the general methods of metal-mining and ore-dressing, particular attention being given to the underlying principles upon which such methods are based. When practicable, students are taken to some mining field for instruction. The full course of instruction in Mining and Metallurgy, for those students who are able to give their whole time to the work, extends over three years, and includes instruction in the following subjects:—

Mathematics, Physics, Applied Mechanics, Engine Erecting, Mechanical Drawing, Geology, Economic Geology, Mineralogy, Theory Chemistry, Practical Chemistry, Assaying, Metallurgy, Metalliferous Mining, Ore-dressing, Surveying, Carpentry, and Blacksmithing.

SURVEYING.—This class is being started this year. The first year's course will be general so as to meet the requirements of the Mining, Agriculture, and Sanitary Engineering students; while the second year's course will deal more particularly with underground surveying.

TEACHING STAFF.—The present Lecturer-in-charge, Mr. C. A. Süssmilch, F.G.S., was appointed in 1903. He received his scientific training partly at the Sydney Technical College and partly at the Sydney University. He is assisted by Mr. W. L. Hammond, B.Sc. (Syd.), and Mr. W. G. Stone (Associate, Sydney Technical College).

When the department was inaugurated—twenty-five years ago—the first lecturer was Mr. S. Herbert Cox, F.G.S., now Professor of Mining at the Royal School of Mines, London. On his retirement in 1886 he was succeeded by Mr. Benjamin Dunstan, F.G.S., who resigned in 1897 to take up the position of Assistant Government Geologist in Queensland, and is now in charge of the Geological Survey of that State. From 1897 until 1902 the position was held by Rev. J. Milne Curran, previously travelling lecturer to the department.

ASSOCIATES AND DIPLOMA STUDENTS.—The following is a list of the students who have completed the full course of instruction for the various diplomas given in this department:—

Year.	Name.	Subject.	Year.	Name.	Subject.
1887	Campbell, J. H.	... Mining.	1904	*Stone, W. G.	... Mineralogy.
1896	Pitt, G. J.	... Geology.	1905	Frankel, D.	... Mining.
1901	Newton, R. G.	... „	1906	*Cass, Miss B.	... Geology.
1902	Walkom, A. J.	... „	1906	Reeve, W. H.	... Mining.
1902	Meldrum, W. J.	... Mining.	1907	*St. Smith, E. C.	... Geology.
1902	Nicolas, D. J. A.	... „	„	„	... Mineralogy.
1903	*Larcombe, C. O. G.	... Geology.	1907	*Brown, L. V.	... Geology.
„	„	... Mineralogy.	1907	*Jones, L. J.	... Mineralogy.
1904	Longmuir, G. F.	... Geology.	1908	„	... Geology.
1904	*Stone, W. G.	... „	1908	*Chapman, Miss L.	... „

* These students qualified for the Associateship of the Sydney Technical College.

TIME-TABLE OF CLASSES.

GEOLOGY—(Lectures)—First Year, Monday, 7 to 8 p.m.; Second Year, Monday, 8 to 9 p.m.; Third Year, Thursday, 7 to 8 p.m.
GEOLOGY (Practical)—Monday, Tuesday, Thursday, and Friday, 6 to 7 p.m., 7 to 8 p.m., or 8 to 9 p.m.
ECONOMIC GEOLOGY—Friday, 7 to 8 p.m.
MINERALOGY (Lectures)—First Year, Tuesday, 7 to 8 p.m.; Second Year, Tuesday, 8 to 9 p.m.
MINERALOGY (Practical)—Monday, Tuesday, Thursday, Friday, 6 to 7 p.m., 7 to 8 p.m., or 8 to 9 p.m.
MINING (METALLIFEROUS)—Friday, 8 to 9 p.m.
ORE DRESSING—Friday, 7 to 8 p.m.
SURVEYING—Thursday, 7 p.m.

Department of Industrial and Decorative Art.

(By P. W. JOHNSON, Lecturer in Charge of Department.)

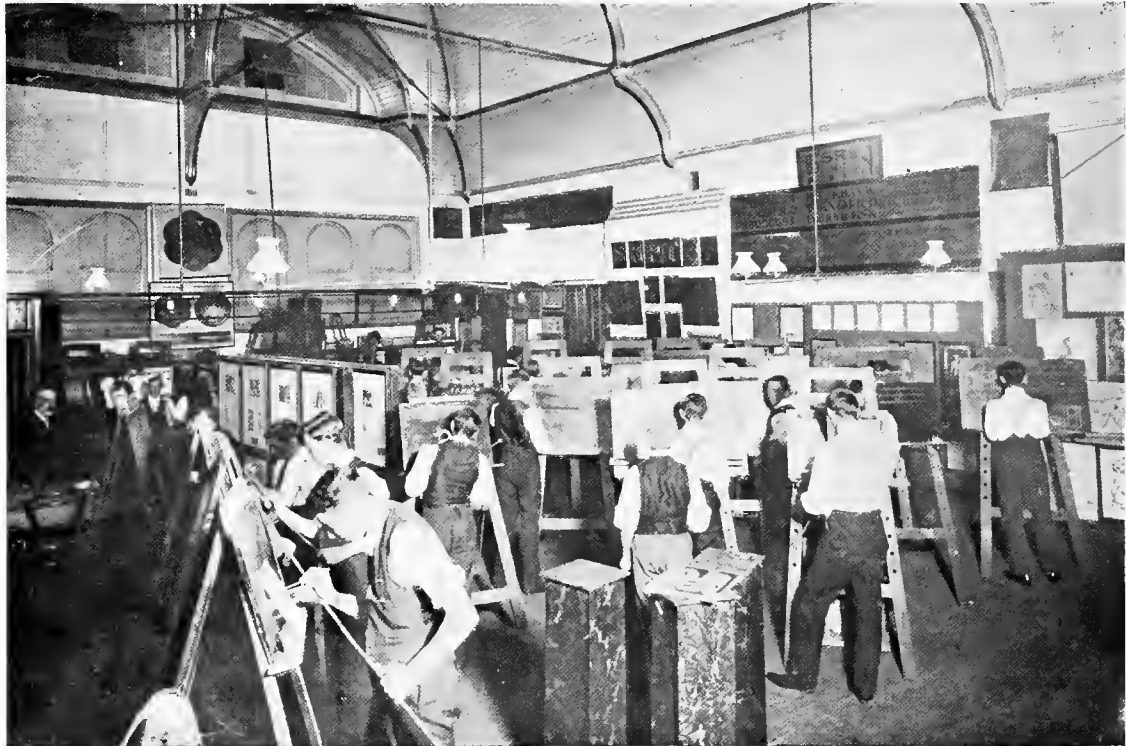
THIS Department was originally formed to give instruction in the different branches into which it is divided. From small beginnings twenty-five years ago the development of the classes has been steady and substantial. In proof of this it may be here mentioned that while the attendance in the early days averaged five or six students, the daily average at the present time is about thirty, and has reached as many as forty students present on one evening. On a special occasion like the present it is only right that the peculiar circumstances under which some of the students attend the classes should be recorded. A greater part are in the painting trade—apprentices, improvers, journeymen, and masters' sons; considering the migratory character of their employment (their work seldom lasting more than a few weeks in one place), and their coming long distances from all parts of the suburbs, the attendance may be looked upon as very satisfactory indeed.



MR. JOHNSON—
Lecturer-in-charge,
Industrial Art Department.

The class-room is large and open, allowing supervision over all students in attendance. At the present time it is carrying its full number of students, and if the classes increase, more accommodation will be necessary. The room is well supplied with teaching apparatus, models, diagrams, &c., all of which have been designed by the Lecturer-in-Charge, and produced in the

College workshops. The department comprises the following classes:—House-painting, Graining



CLASS-ROOM OF INDUSTRIAL AND DECORATIVE ART.

Students at Work.

and Marbling, Signwriting, Ticket-writing, Decoration, Illumination, and Design. They are so divided to enable each student to gain the knowledge he most desires. A student engaged in signwriting wishes to learn decoration or illumination; a decorator, signwriting or graining; and so on through the list—working at one branch of the trade during the day, studying and trying to perfect himself in another branch in the evening, an endeavour which, but for the facilities afforded by this Department, he could not accomplish, at all events, so effectively.

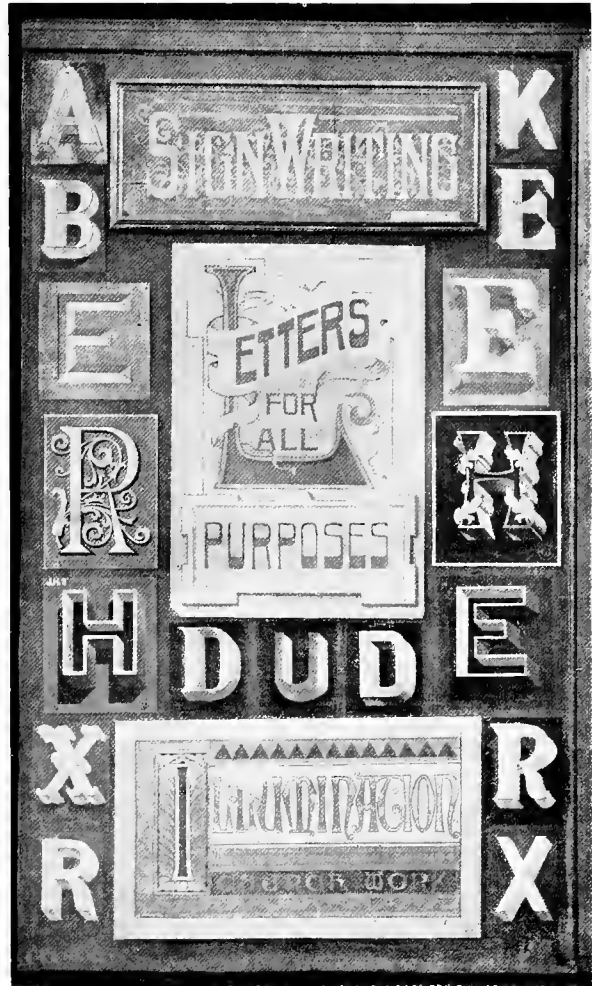
HOUSE-PAINTING is an elementary subject in which the mixing, grading, and harmonizing of colours is taught; the composition and application of colours in oil, spirit, distemper, and enamel; the staining and varnishing of wood; stencilling in different mediums, and other knowledge of a general character useful to a house-painter. This class has never been very large, as the students have an opportunity of practising much of the subject in their daily employment.

GRAINING AND MARBLING is a class largely, and, in some years, wholly made up of students following the painting trade during the day. Here an opportunity is given each student to gain an insight into graining and marbling by all the different methods in oils and water-colour—a system of graded lessons is applied to the different examples of wood and marble, developing into specimens of work executed by the student without the assistance of a copy.

SIGNWRITING is a class of great value to others besides the student engaged in painting signs, a thorough grounding is first given in the formation and painting of letters, this instruction is applicable to lithography, map and plan drawing, carving, and other work where lettering is required. The succeeding lessons apply more to the signwriter, and include setting out, proportion, blocking, shading, and application of letters to particular purposes. Following this, instruction is given in gilding and ornament on glass, then a course of lessons in making water-colour sketches to scale, and enlargement of the different parts, such as ribbons, tablets, shields, scrolls, monograms, and ornamental letters required in the execution of better class work.

TICKET-WRITING is a new class not yet thoroughly developed. The elementary part is identical with signwriting, and afterwards ink or water-colour is used instead of paint, all the gilding on glass omitted. The finishing part of the course is much the same as the third year of signwriting.

DECORATION in the first lessons commences with drawing, painting, cutting, preparing, and applying stencils of suitable ornament for walls, door, or ceiling. Afterwards a course of brushwork is given consisting of a complete set of painted ornaments, such as corner, break, centre, panel, borders, diapers—all to match. Next the treatment of working drawings,



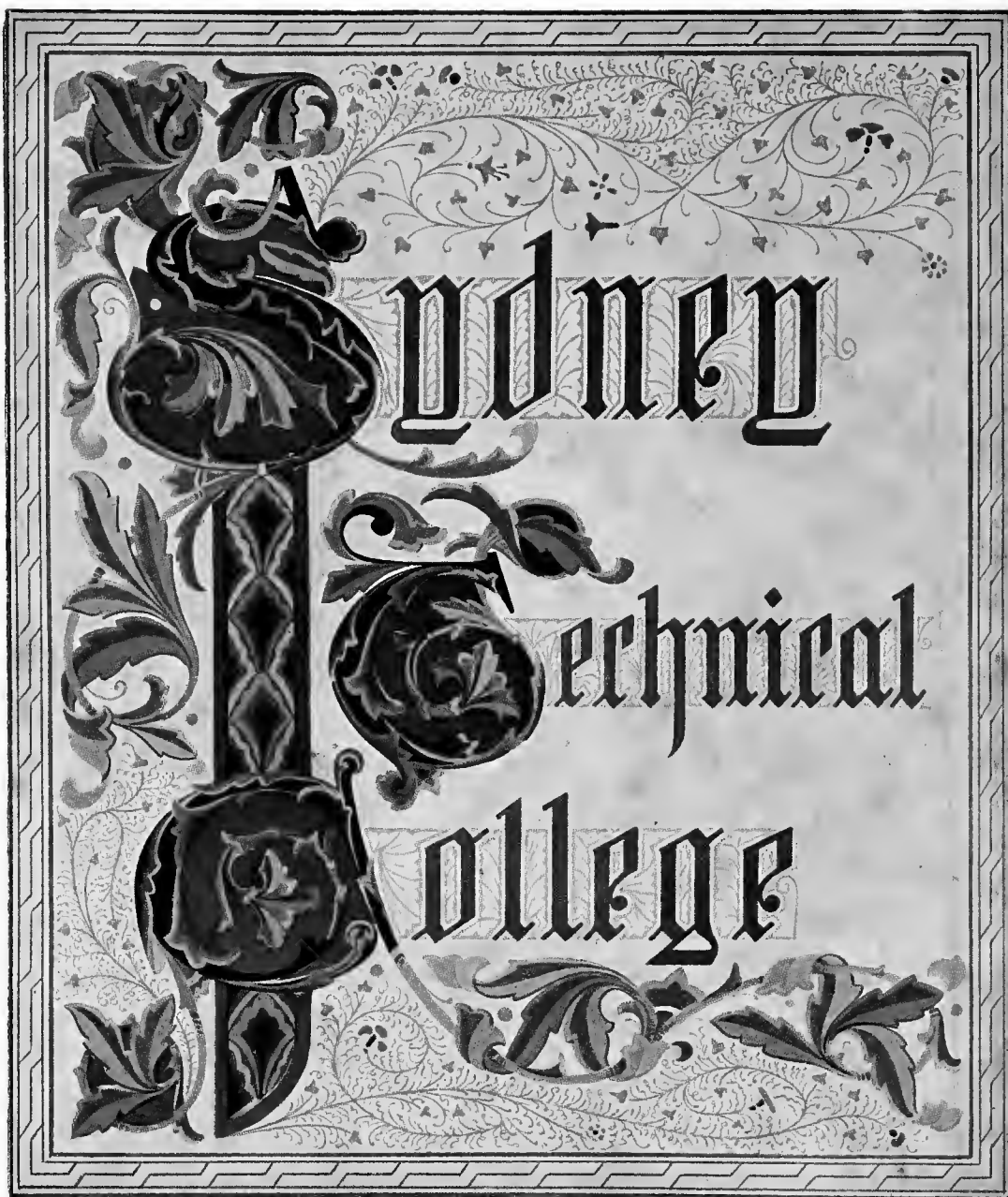
WORK OF STUDENTS IN SIGNWRITING CLASS.



ART AND INDUSTRIAL ART EXHIBIT, CHRISTCHURCH, NEW ZEALAND, 1906-7.



EXHIBITION, FEBRUARY 1904, STUDENTS' WORK, INDUSTRIAL ART CLASSES.



EXAMPLE OF STUDENT'S WORK.

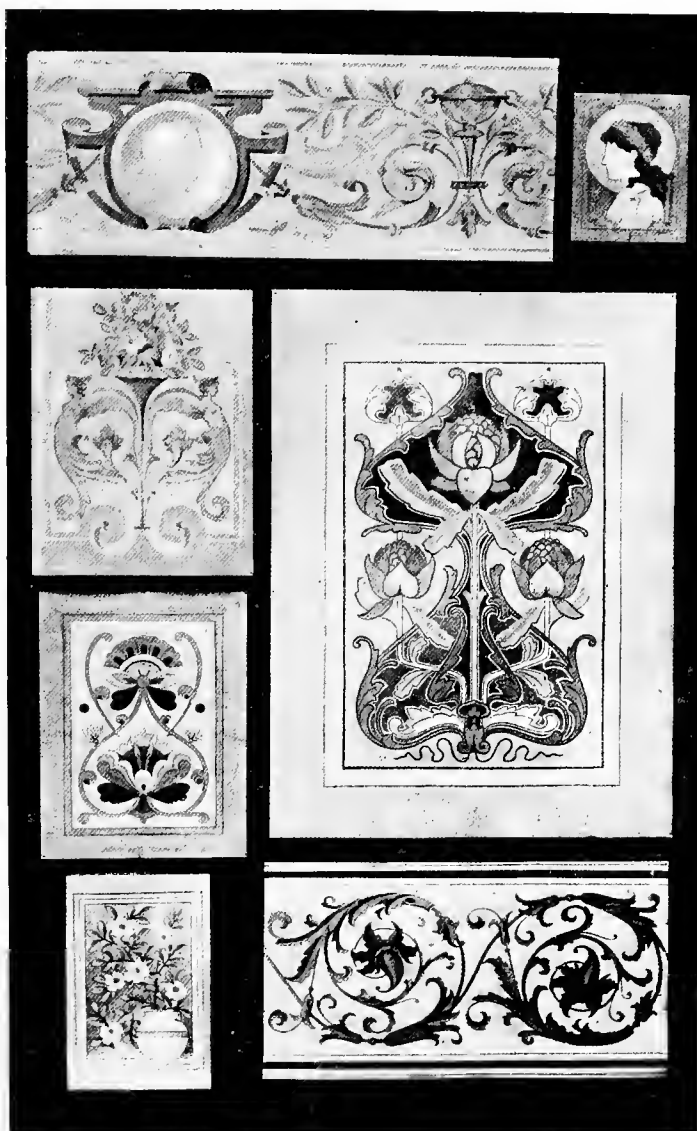
Executed in the Illumination Class.

pounces, and their application to prepared grounds, comes under notice, along with a course of colouring ornament in flat, outline, monochrome, and relief, all in flattening or dead colour. After this, complete friezes, panel, and other ornaments are worked out in gold and colours, in conjunction with scaled and coloured sketches or plans of the work. Briefly put, the course of instruction is such as will enable a student to produce a coloured sketch or plan of an idea for the decoration of the side of a room or its ceiling; draw and cut the stencils (if they are required); sketch and finish the working drawings of all ornamental parts; and colour and finish all details in a proper manner.

ILLUMINATION.—Much of the work in this class is useful to the signwriter and decorator, and may be applied to churches or other places where a permanent result is required. The course of instruction comprises the best forms of alphabets, borders, scrolls (foliated and conventional), small initial letters, and other necessary details, followed by larger initial letters in various ornamental methods, use of gold and colour in borders and initials, setting out and working given examples in the art of illumination.

DESIGN.—A three years' course of practical work, the elementary portion embracing the use of straight and curved lines as foundations for border and other ornament, radiation from point as centrepieces, vertical line as panels, curved line as scrolls, diapers or space filling on the principal geometrical figures, flowers and foliage conventionalized, and applied to given spaces. Each student is expected to produce

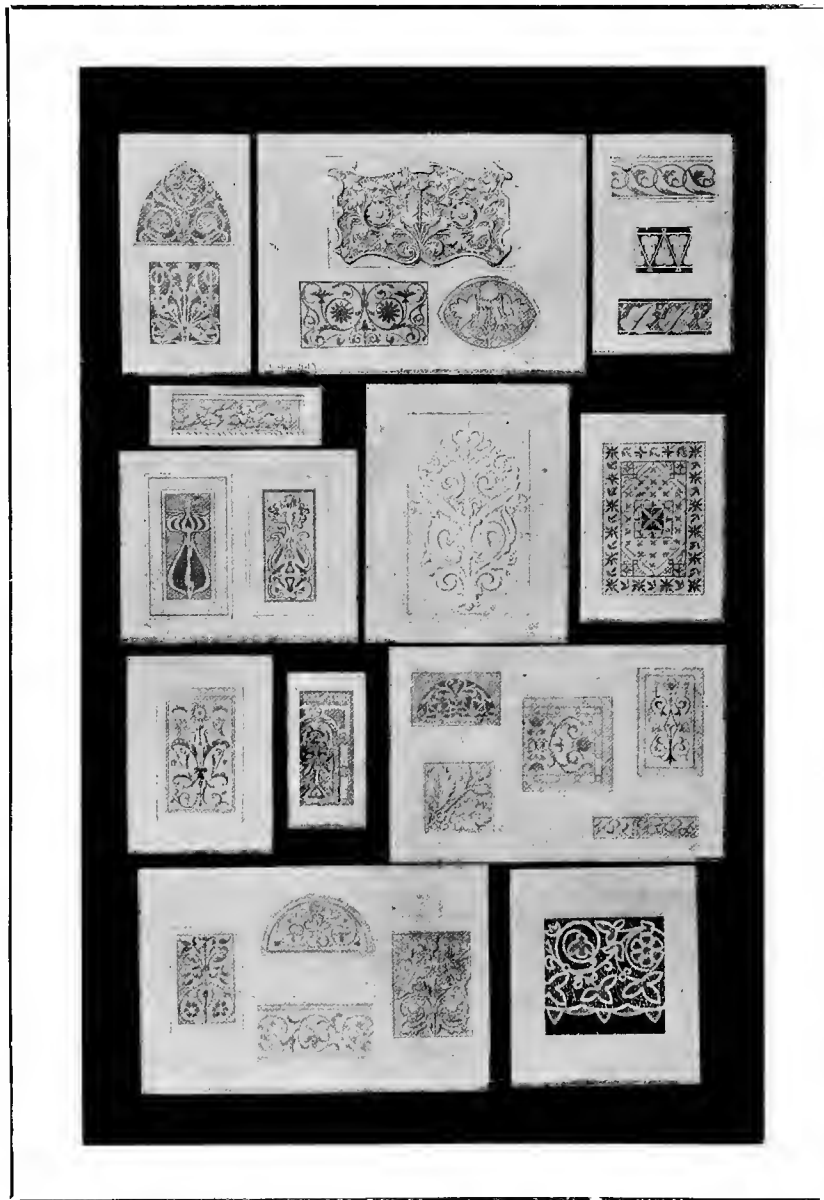
as a result of three terms' instruction a composition comprising corner, centre, border, and diaper, with the constructive lines founded on the same geometrical figure, and all ornamental detail based on the same leaf or flower, the whole to be executed in appropriate colour. The first year's course is generally useful as a foundation for many purposes, and the results are individual on the part of each student, the work of no two being alike. The second year is a development of the latter part of first-year work, all forms being derived from flowers, foliage, or other natural objects, and applied to designs for wood, iron, glass, tiles, and a number of other purposes. Here again originality is produced



ART DECORATION BY STUDENTS IN DESIGN CLASS.

and the student encouraged in any originality he or she may possess. Along with the second year's course (in extra lessons) a study of any special line may be made—as for example—a student may devote one lesson (or more) per week to designing for (a) decorative ornament, or (b) stained glass, or (c) lace-work, or other subjects mentioned in the syllabus.

The third year is devoted to a study of the principal styles of historic ornament—their structure, details, and meaning; here, in many cases, originality is barred, as the forms are fixed and cannot be departed from, but much good work is obtained by following certain lines



ORIGINAL DESIGNS BY STUDENTS IN DESIGN CLASS.

in study. For example—given a space (panel) to fill with twelve different styles—Egyptian, Greek, Pompeian, Roman, Arabesque, Moresque, Persian, Gothic, Japanese, Chinese, French, and Italian Renaissance; if the construction, origin, and use of foliated and other forms of the different styles are thoroughly understood, much excellent work will result therefrom in filling the twelve spaces.

PROGRAMME OF CLASSES.

DEPARTMENT OF INDUSTRIAL AND DECORATIVE ART.

P. W. JOHNSON, Lecturer in Charge of Department.

CHAS. TOMS, Assistant.

HOUSE-PAINTING (General Course)—Tuesday and Thursday, 7 to 9 p.m.

GRAINING AND MARBLING—Tuesday and Thursday, 7 to 9 p.m.

SIGNWRITING (First and Second Year)—Monday, Wednesday, and Friday, 7 to 9 p.m.

SIGNWRITING (Advanced)—Monday, Wednesday, and Friday, 7 to 9 p.m.

DECORATION (First and Second Year)—Monday, Wednesday, and Friday, 7 to 9 p.m.

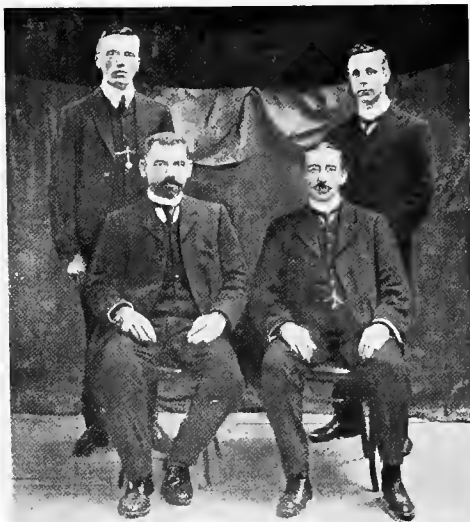
ART DECORATION (Advanced)—Monday, Wednesday, and Friday, 7 to 9 p.m.

*DESIGN AND ILLUMINATION—Tuesday and Thursday, 2.30 to 4.30 p.m., and Monday, Wednesday, and Friday, 7 to 9 p.m.

*Fees, Senior Scale.

Department of Mathematics.

(By NORMAN FITZ, B.E., Syd., Lecturer in Charge of Department.)



STAFF OF THE DEPARTMENT OF MATHEMATICS.

Left to right—

Front row: Mr. Fitz, Lecturer in Charge of Department; Mr. Downward, Day Engineering Classes, Geometry, Applied Mechanics, and Machine Design.

Back row: Mr. Tonkin, English and Mathematics, Day Continuation Technical School; Mr. Middleton, Teacher of Mathematics.

UNDER this Department are grouped a number of sub-departments which, covering as they do the work done in more than one of the great departments of the College, could not conveniently be placed under any one of them. Thus, in addition to the pure mathematics, which of course is a foundation subject for all the departments of the College, except, perhaps, that of Art, the head of this Department, who is himself a Bachelor of Engineering, takes a general control over the Day Engineering classes. These receive a training involving attendance at classes under the Mechanical, Electrical, and Sanitary Engineering Departments, and also the Departments of Chemistry and Architecture, thus covering five of the great departments. The new Technical Day Continuation School, which in respect to the variety of subjects studied, resembles the Day Engineering Classes, is also directly under the control of the writer.

Taking then those sub-departments in the order above stated:—

MATHEMATICS.

This Department provides systematic instruction in elementary Mathematics, both for day and evening students. For the former a three-years' course is arranged, and for the latter a two-years' course. Students are enabled to obtain a good grasp of the subject, whether as a subsidiary subject in the course of their professional training at the College, or for the entrance examination to the University. The number of individual students enrolled for the day classes is 75, and for the evening classes more than 100 students are enrolled. The subjects at present taught are Geometry, Algebra, Arithmetic and Mensuration, Trigonometry, Statics and Dynamics.

PROGRAMME OF CLASSES,

NORMAN FITZ, B.E. (Syd.), Lecturer in charge of Department.

Assistant Lecturer—R. J. MIDDLETON, B.A. (Syd.).

GEOMETRY—Monday, First year, 7 to 8 p.m.; Tuesday, Second Year, 7 to 8 p.m.

ALGEBRA—Monday, First Year, 8 to 9 p.m.; Tuesday, Second Year, 8 to 9 p.m.

TRIGONOMETRY—Thursday, First Year, 7 to 8 p.m.; Friday, Second Year, 7 to 8 p.m.

ARITHMETIC AND MENSURATION—Thursday, First Year, 8 to 9 p.m.; Friday, Second Year, 8 to 9 p.m.

ELECTRICAL AND MECHANICAL ENGINEERING DAY CLASSES.

These classes were established in February, 1902, by Mr. D. J. Cooper, M.A., the then Superintendent of Technical Education. Until that time no systematic attempt had been made to train day students in Engineering at the College, although good work had been done for many years with the night classes, in giving instruction to those already engaged in engineering works.

It was felt that there was a demand for training youths who had just left the higher classes in our public schools, in the engineering profession. It was with the object of meeting this want, by providing the means of combining, so far as possible in a Technical College, the practical experience of the workshops with systematic instruction in mathematics and science. that these organised engineering classes were established. The conditions of entrance are that the candidate shall be 16 years of age, and be able to pass an examination in English, Arithmetic, and Algebra. The hours are from 9.30 a.m. to 4.30 p.m., Monday to Friday, and the course extends over a period of three years. For the FIRST YEAR the instruction for both classes is the same, and the subjects studied are Mathematics, Physics, Chemistry, Freehand, Model, Geometrical, and Mechanical Drawing, Carpentry, and Metalwork. In the SECOND YEAR the subjects are Mathematics, Chemistry, Mechanical Drawing, Applied Mechanics. Fitting and Turning, Patternmaking, and Electrical Engineering. For the THIRD YEAR—Mathematics, Machine Design, Applied Mechanics, Fitting and Turning, Ironfounding, Blacksmithing, Metallurgy, Sanitary Engineering, and Electrical Engineering (for students of that class only).

Class examinations are held at the end of the First and Second Terms, and the yearly examinations, are conducted by outside examiners. At the end of the Third Term a student must pass the annual examination before proceeding with the next year's course. Students who pass successfully through the whole course are entitled to the College diploma.

On opening the classes, thirty-six students enrolled, while the number at present in attendance is forty-four. The College diploma has been awarded to thirty-four students, and the P. N. Russell scholarship at the University has been won by five students from these classes.

STAFF OF INSTRUCTORS.

<i>Electrical Engineering</i>	...	...	R. C. SIMPSON, A.K.C., A.M.I.E.E., Ass. Am. I.E.E. Lecturer.
<i>Mathematics</i>	...	...	N. FITZ, B.E., Lecturer.
<i>Applied Mechanics</i>	1	...	J. N. DOWNWARD.
<i>Geometrical Drawing</i>	1	...	J. N. DOWNWARD and W. A. PHILLIPS.
<i>Mechanical Drawing</i>	...	...	W. J. C. ROSS, B.Sc. (Lond.), Lecturer.
<i>Chemistry</i>	...	...	J. L. BRUCE, Mem. Royal San. Inst., Lecturer.
<i>Sanitary Engineering</i>	...	...	OWEN BLACKET, Lecturer.
<i>Descriptive Engineering</i>	...	...	J. HANLEY.
<i>Fitting and Turning</i>	...	...	W. A. PHILLIPS.
<i>Pattern-making</i>	...	...	T. A. WILKIE.
<i>Carpentry</i>	...	...	P. GRIFFITHS.
<i>Blacksmithing</i>	...	...	G. J. PITT.
<i>Ironfounding</i>	...	...	L. C. MORRIS, P.N.R. Scholar.
<i>Physics</i>	...	...	F. W. ATKINS.
<i>Freehand and Model Drawing</i>	...	...	

The portraits of all of those gentlemen appear in the groups showing the staffs of the great Departments of the College.

TECHNICAL DAY SCHOOL.

One of the problems of education in the State arises from the difficulty of dealing with boys and girls who have completed an elementary primary course, but are not prepared to follow it through a secondary course to the University. An attempt is being made to solve this problem by means of the Technical Day School, which has just been established.

The object of the school is to prepare youths on the completion of their primary course for technical training. On the part of the boys, such training will aim at fitting them for technical work in Engineering, Mining, or Agriculture; while the wants of the girls will be met in the direction of Domestic Science and Woman's handicrafts, particularly Cookery, Housewifery, Laundry, Dressmaking, and Millinery.

The subjects of instruction and the time per week devoted to each are:—English, 3 hours; Mathematics, 8 hours; Science, 6 hours; Manual Training in woodwork and ironwork, 4 hours; Drawing, 4 hours. The total time occupied is therefore equivalent to that usual in the primary school course. Saturdays are free from work at the school.

ENGLISH.—The syllabus arranged is only tentative. Pupils of somewhat varied proficiency have been enrolled. Later when the numbers justify it, a subdivision of the school into classes will be carried out. At present the curriculum in English is an intensive study of the works set down in the Junior University course. It includes (a) "A Tale of Two Cities"—motive plot, characterisation, style, and literary merits, with a review of the historical events on which the story is based, and embracing an account of the author's life. (b) Selections from "Golden Numbers" with explanatory treatment of words, phrases, and allusions. Sketches of the authors of the poems treated. (c) The Art Reader, assisted and amplified by copies of works of art to be seen in the Art Gallery. (d) General reading of standard works such as "Lamb's Tales," "Treasure Island," "Adam Bede," "The Vicar of Wakefield," and "David Copperfield."

In addition to the foregoing, Composition will be treated in a manner calculated not only to improve the technical skill of the pupils in the art, but to excite their imagination, cultivate the faculty of observation, and to strengthen their powers of narration.



TECHNICAL DAY SCHOOL—PRACTICAL GEOMETRY CLASS.

The English course is under the direction of Mr. Tonkin.

MATHEMATICS.—This section is also under the control of Mr. Tonkin. It includes:—

(a) Arithmetic.—A practical course of commercial arithmetic, attention being also paid to the metric system so useful to pupils in their Science work.

(b) Mensuration, also of a practical nature, especially directed towards the more advanced work that every student in engineering and mining must master.

(c) Algebra, on the lines of the Junior, and covering the usual course as far as Quadratics, Surds, and Indices. Graphical work is made a special feature.

(d) Geometry—constructive problems—graphical exercises—the geometrical determination of areas, the higher theorems of Book I and II, theorems and problems in relation to the circle, and the connection between circles and rectilineal figures.

(e) Trigonometry, of an elementary, but highly practical nature, involving an understanding of the various ratios, circular measure, &c., and practice in trigonometrical constructions.

While it is not claimed that the scheme of mathematics is complete, it is certain that its strong feature is its aim in the direction of engineering, &c. No boy is put back to the more elementary work if previous preparation has fitted him for the higher branches of mathematics.

SCIENCE.—This important subject is under the care of Mr. L. Morris, of the staff of the College. The course includes:—

(a) Physics.—Under the subdivision of Mechanics we find the course embraces the metric system of measurements of Length and Mass—area of irregular figures by means of squared paper, and by weighing—of Volume—by displacement of water, of Time by shadow stick. Clocks, pendulum, balance-wheel, levers, pulleys, inclined planes, and other mechanical powers are also included.

Pressure of Gases is treated, involving the study of the Balloon, the Barometer, &c., illustrated by Barometric graphs, the Steam Engine, Liquid Pressure, leading up to hydraulic Machinery, Artesian Wells, Lift and Force Pumps. The principle of Archimedes, Specific Gravity, Elasticity, and Hooke's Law round off this sub-section.

The study of Heat and its effects on solids, liquids, and gases, involving the laws of expansion, evaporation, conduction, and convection, together with the proper understanding of such instruments as the thermometer and hygrometer, form the second part of the curriculum in Physics.

The application of this course to mining and engineering is kept well to the front. Frequent practical experiments are made to elucidate principles.

(b) Chemistry.—In this department of Science, which is under Mr. W. Clunies Ross, theoretical lessons on the elementary principles of Chemistry and related sciences will be followed by short studies on the preparation and properties of the more important gases, together with some account of the more important non-metallic elements.

The practical side of the treatment will deal with glass-bending and glass-blowing, and the fitting up of wash bottles and other apparatus. Preparation and experimental demonstration of the properties of gases will follow.

As in other directions the work of the first year of the Technical Day School in Science is largely tentative. Next year it is hoped that a more detailed syllabus will be available.

(c) Physiography.—The treatment of this branch of Science is largely cultural in its aim, and is particularly directed towards preparing pupils for a course in geology, which must be taken by those who wish to receive technical instruction in mining. Mr. C. Sussmilch, the College lecturer on Geology, has charge of the Physiography work of the school. He has drawn up a very complete syllabus of work, dealing with:—(1) The Earth as a whole, its size, form, motions, inclination, relation to solar system and terrestrial magnetism. (2) The Atmosphere, its composition and properties, its temperature, moisture, pressure, and circulation, with not only the physical phenomena arising therefrom, but the scientific appliances for observing, comparing, and recording these phenomena. (3) The Hydrosphere, its distribution, composition, temperature, movements, contents, and the various resultant natural phenomena. (4) The Lithosphere, its relief features, materials, changes and other phenomena due to various agencies, crust movements, and the history of its physiographical features.

WOOD AND IRONWORK.—The object of this course is to train the hand and the eye, and particularly to give the students a knowledge of all hand and pocket tools used by engineers

They will also be instructed in the use of measuring instruments, and the application of callipers, compasses, squares, angle-gauges, and other such appliances. Light exercises in the use of the hammer and file will be practised by the students. This department will be under the control of Mr. J. Hanley; while a course of elementary carpentry or woodwork will be conducted by Mr. T. A. Wilkie. The course will also include lectures on timbers and tools.

DRAWING.—The Superintendent lays great stress on the predominance given to drawing in German schools of all grades. It is used there to an extent of which we have little, if any, conception. For the Technical Day School under notice there has been laid down a course of geometrical drawing similar to that given to the general student of the College. It includes all the simple problems in plane geometry, and the usual study of projections necessary to inculcate the first principles of plans, elevations, and sections of solids in different positions.

Illustrations of the practical application of geometrical truths to various trades will be given. The course of Freehand and Model Drawing is elementary in its scope; special attention being given to good construction, so as to enable students to make rapid and accurate perspective sketches of any object which may be placed before them.

The fee for the full annual course of three terms of fourteen weeks each is £1 is. Scholarships and bursaries are provided for worthy candidates. This term there are eighteen boys and two girls holding either scholarships or bursaries, while there are also ten paying students. At present the Fifth Class Primary standard is sufficient to qualify a pupil for entrance. This standard is not a high one, but has been so set to meet the case of country pupils. The Continuation Schools at Granville, Newcastle, and Goulburn are to be conducted on the lines of the Sydney Day Technical School. The next examination for scholarships and bursaries will be held in July.

Mechanical Engineering Department.

(By OWEN BLACKET, Lecturer in Charge of the Department).

WHEN the Board of Technical Education first started classes, one of the sections was that of Applied Mechanics, which embraced Mechanical Drawing and Applied Mechanics; shortly afterwards the Board secured some old buildings in Kent-street and turned them into workshops for Fitting and Turning and Plumbing; the next move was to add a small shed to hold two fires for Boilermaking, which was the first start in practical engineering work.



THE STAFF OF THE MECHANICAL ENGINEERING DEPARTMENT.

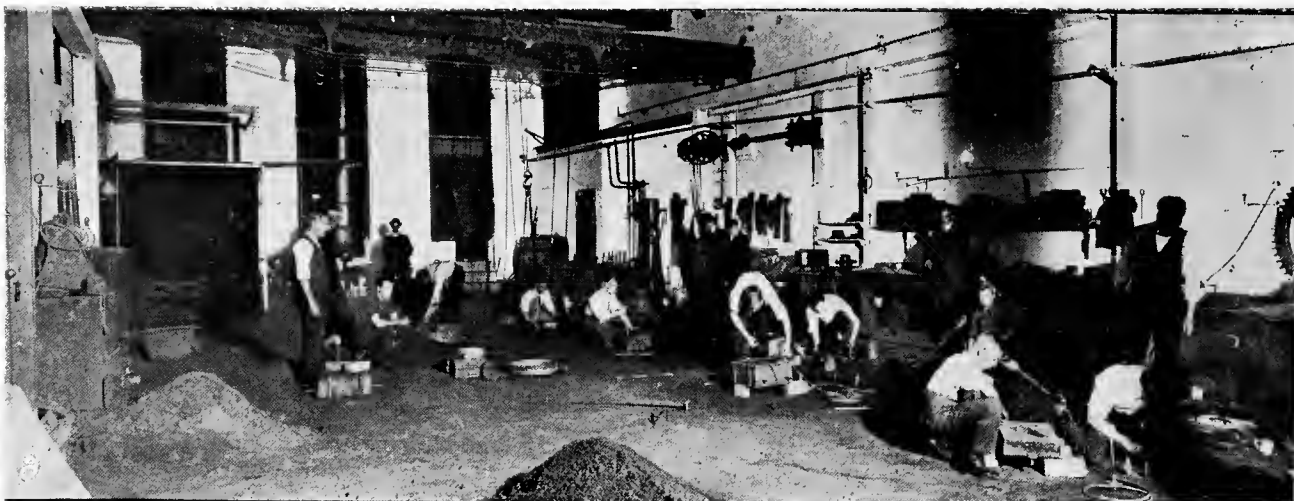
From left to right—

Front row: Mr. Phillips, Pattermaking; Mr. Griffiths, Blacksmithing; Mr. Blacket, Lecturer in Charge; Mr. Hanley, Fitting and Turning; Mr. Pill, Foundry.

Back row: Mr. Flannigan, labourer; Mr. McGrath, Model-maker; Messrs. Brown, Stocker, Clargo, Chalmor, Edgington, and Davis, Assistant Teachers; Mr. Collet, labourer.

In the year 1886 Mr. Owen Blacket was appointed Instructor, and he recommended the change of name to Engineering, which was the name for some years, when it was again changed to the Department of Mechanical Engineering, to distinguish it from other engineering branches which had been started; at the same time the title of Instructor was altered to that of Lecturer-in-Charge. It is remarkable how the small matter of a name led students to enrol: under the name of "Mechanical Engineering" they understood what it meant, but the term Applied Mechanics did not appeal to them.

A very few years of College work was sufficient to show that the accommodation in Kent-street was far too small for the Mechanical Engineering Department, and fortunately for the Department the then Minister for Education, Mr. Carruthers, grasped the situation and immediately set in hand the building of workshops at Ultimo. Each Lecturer in the College was asked to draw up a plan of his requirements, and adverse comment was at that time made as to the big ideas of the Mechanical Engineering Lecturer, as it was considered he was asking for more than was necessary for requirements.

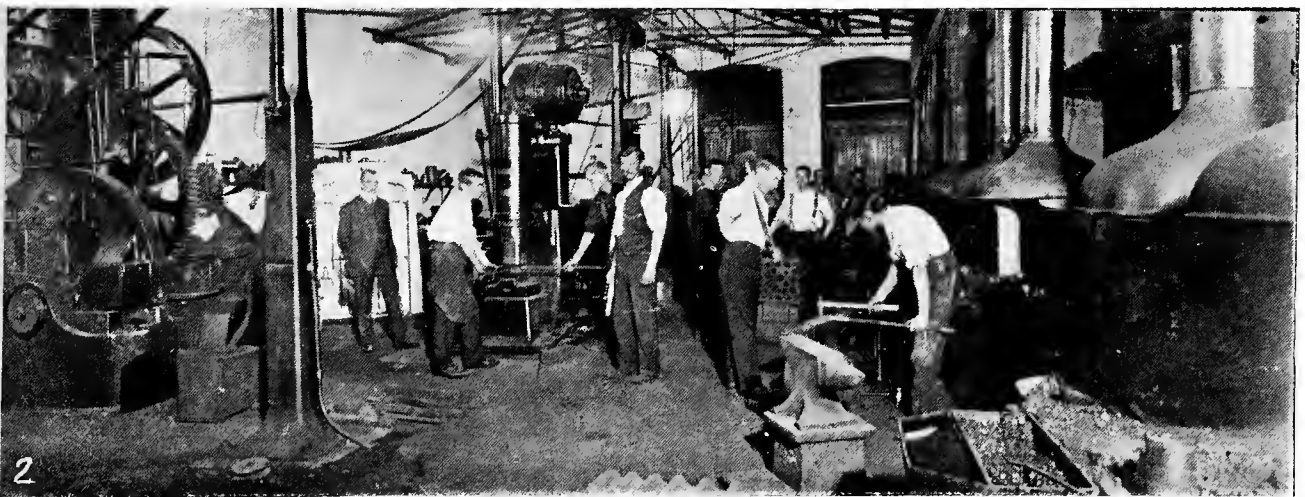


THE FOUNDRY. MECHANICAL ENGINEERING DEPARTMENT, SHOWING MOULDING IN PROGRESS.



FITTING AND TURNING: STUDENTS AT WORK ON THE MACHINE FLOOR.
(Second stage of training.)

In 1891 the machinery in Kent-street was moved to the new workshops at Ultimo, and special appliances which had been ordered from England were also received and erected there, and in the first term of 1891 the mechanical workshops were started. It was very soon found



1. FITTING AND TURNING SHOP: CHIPPING AND FILING.
(First stage of practical work.)

2 BLACKSMITH'S SHOP, SHOWING STUDENTS AT ELECTRICAL HAMMER.

that the public fully appreciated the new workshops. The enrolment and desire for extended information increased so much that instead of working on three nights per week only, as had been the practice, it soon became necessary to work five nights per week. As time passed

not only was it found necessary to hold classes every night, but every day as well. Further additions have had to be made to the workshops from time to time, till all the vacant ground is now occupied; but the demand continues to increase for education; still the students come in increasing numbers, showing how the value of the technical training in Mechanical Engineering is being most largely appreciated.

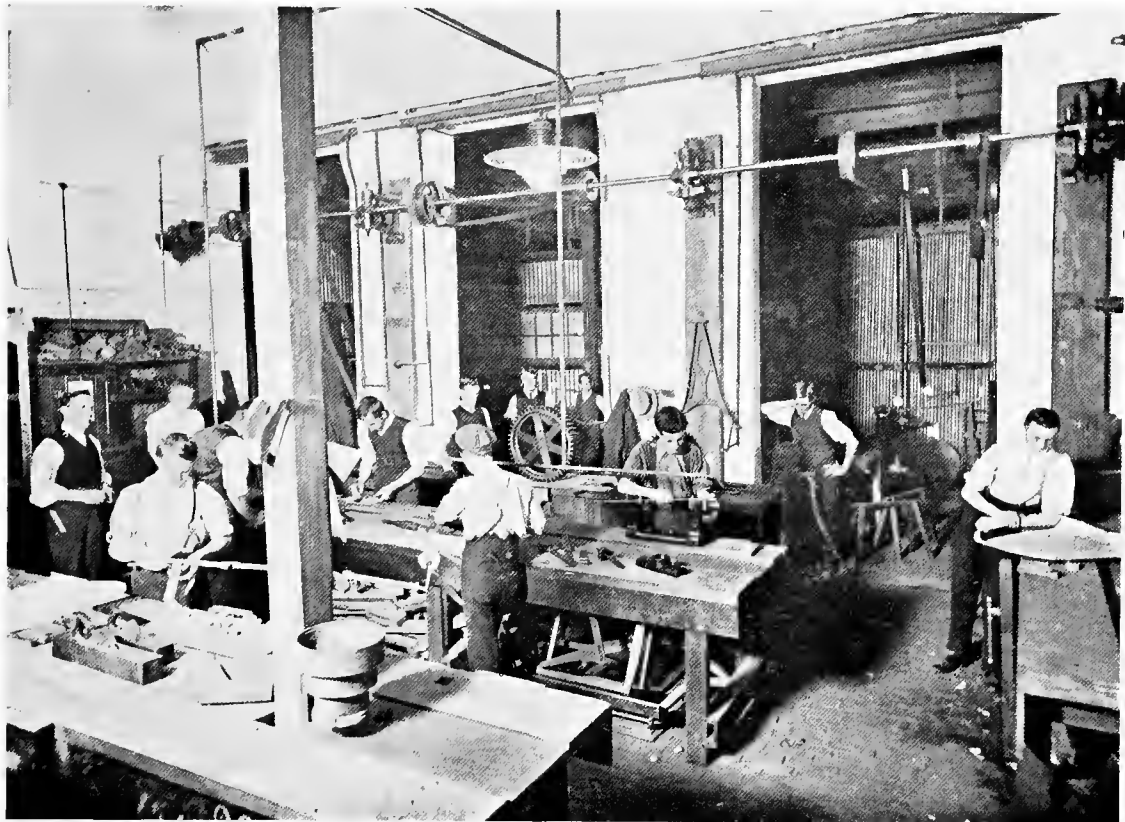
The late regulation of the Industrial Court to the effect that every apprentice to engineering must attend the Technical College classes for at least two years of his time in some branch of his trade, is likely to swell the enrolment a long way above the present capacity, which only proves the necessity of immediately arranging for further additions to the workshops and other class-rooms.



MECHANICAL ENGINEERING LECTURE-ROOM MR. HANLEY DEMONSTRATING ON BLACKBOARD.

The Engineering profession embraces a great many subjects, and it may be safely said the mechanical portion is the foundation. The Technical College gives great opportunities for a student to learn something in this portion, it is a debatable point as to whether a student should first attend the College classes and then go into a workshop, or should serve his apprenticeship conjointly with his technical training. On one point, however, all agree, namely, that a student cannot learn his trade fully in either alone, and to be a thorough master of his work, he must have practical workshop experience as well as a college training.

The mechanical side is again divided into many branches—Mathematics, Drawing, Blacksmithing, Patternmaking, Ironfounding, Fitting, and Turning, &c. An employer has not time to teach mathematics; there is not room in the drawing office, so one has to take up one of the trades; apprentices are put to the one he has a vacancy in, and where he can make the most money for him. There the apprentice gains merely a smattering of some one branch of a trade. If he joins the Technical College, in conjunction with his workshop training, he has the opportunity of learning, say—first, mathematics, the backbone of all the sciences; next he can



PATTERNMAKING CLASS-ROOM AND CLASS.



ART METAL-WORK IN WROUGHT-IRON,
By Peter Griffiths, Teacher of Blacksmithing.

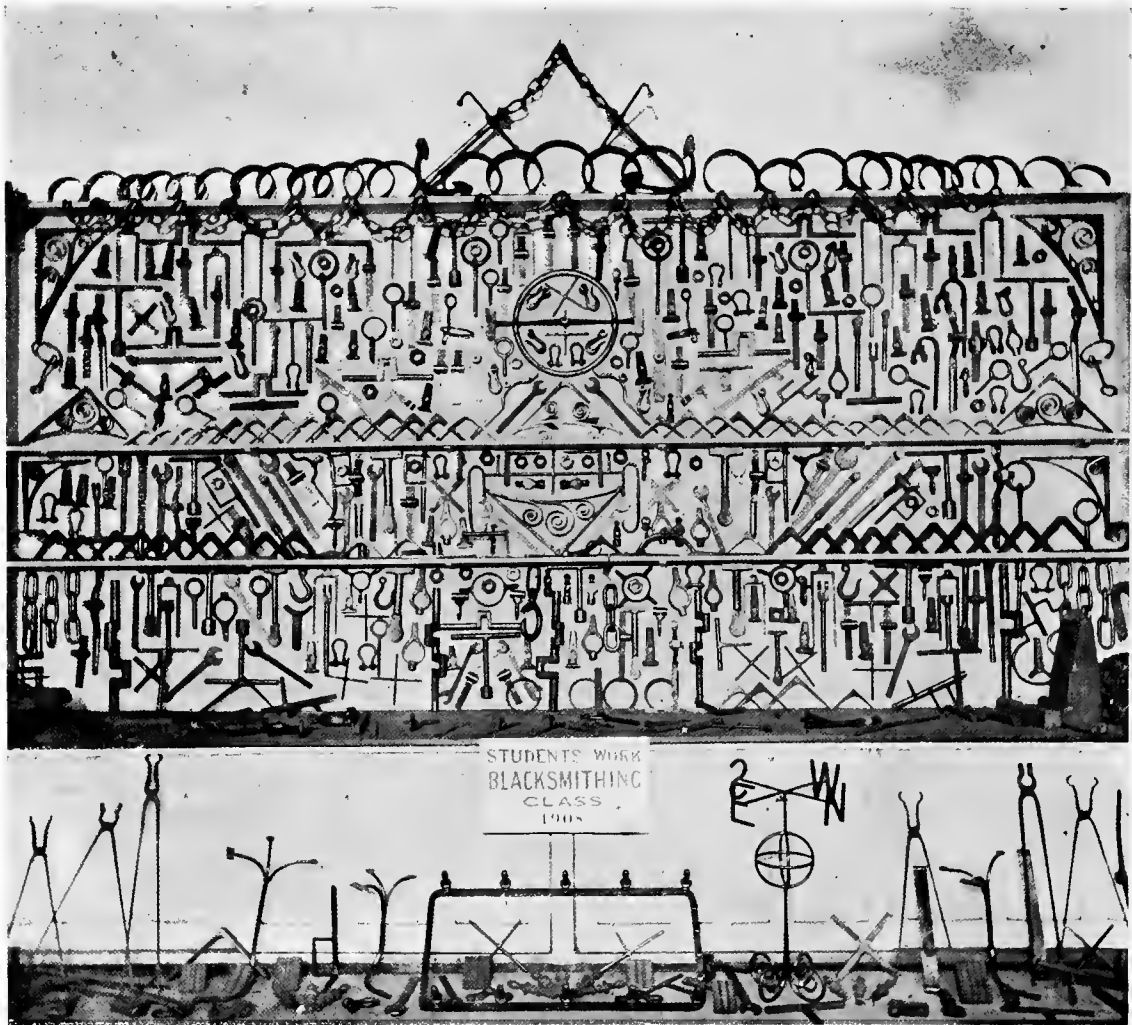


FOUNDRY WORK.

The Pattern, the Mould, and the Casting of a Screw
Propeller.

learn mechanical drawing, the universal language that all can understand, and he also has the chance of learning the laws that underlie the special branch of the trade he has decided on as his calling, whether blacksmith, patternmaker, or moulder.

The term "engineer" is a vague and misleading one, which is used by many tradesmen simply because it is associated in their minds with machinery; but when we come to inquire into their work it will be found that it is in many cases merely either that of a driller, a planer, a fitter, or a turner, and very likely the so-called engineer cannot explain even the working



of a steam engine. Such men have the opportunity at the College of gaining a better right to use the name "engineer," because the study of mathematics, mechanical drawing, and applied mechanics gives them an insight into parts of machines and laws of science which they could never learn in a workshop. It also helps to make their daily work more interesting when they can understand how the particular portion of the machine they are making is to be used.

It can easily be understood that during the quarter of a century that the College has been established many hundreds of students have passed through the various classes, and in

many cases the students of to-day are the children of former students. The engineering profession gives great opportunities of travel to those who can work their way on board steamships and so take employment in other countries, and repeatedly letters are received from the old students from England, America, China, India, and Africa, and in every case it is the same story—"I owe my position to the instruction I received at the Sydney Technical College." It would be impossible to give a list of the high positions obtained by successful students, but attention may be drawn to the fact that more than half the teachers in the Engineering Department have been students of the College, and several of them have been in England or America

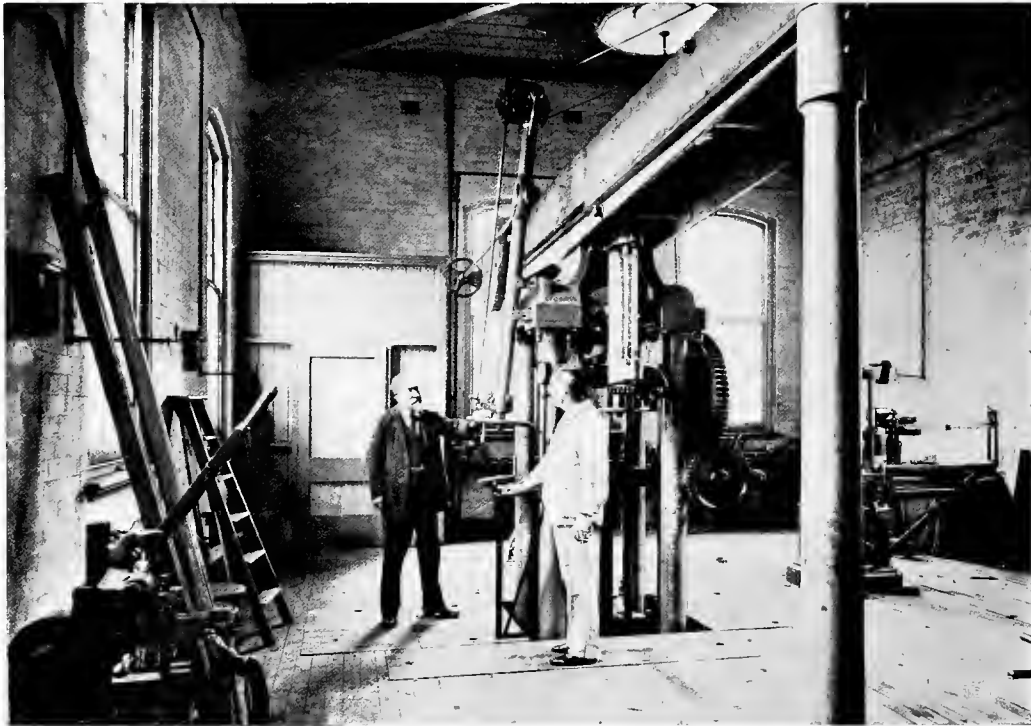


THE FIRST FITTING AND TURNING SHOP, IN KENT-STREET, 1885.

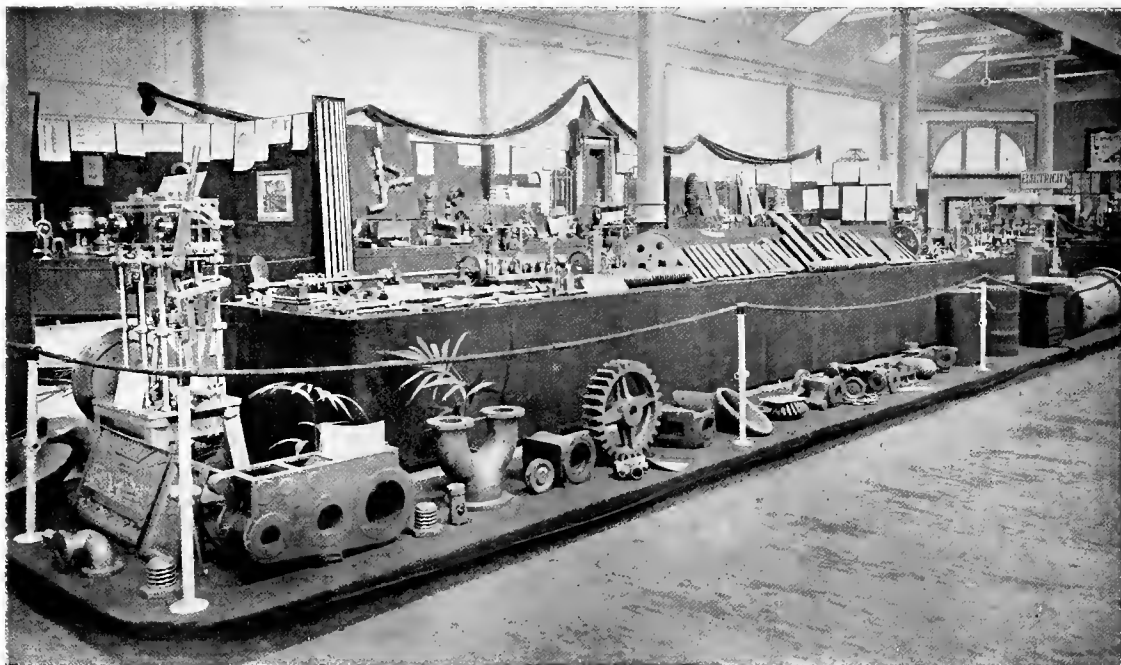
for some years improving their knowledge, and in that way they have brought back to the College information gained in other countries, so helping to keep the teaching abreast of the most modern methods there adopted.

The course of instruction is arranged so as to meet all classes of students, those who merely wish to get an insight into mechanical work as well as those who desire to fit themselves for the higher work of designing with a facility for the calculations required for such work. It is very pleasing to notice how, during the last few years, the percentage of students taking up the theoretical training—as well as the practical—has increased, and there can be no doubt that the technical teaching is in this way taking effect for good in the factory and the workshop.

In workshop practice and general management, the College training gives many lessons to factory proprietors, and that it is remembered and appreciated is shown by the improvements which may be noticed in our modern workshops, where the owner or manager has been a

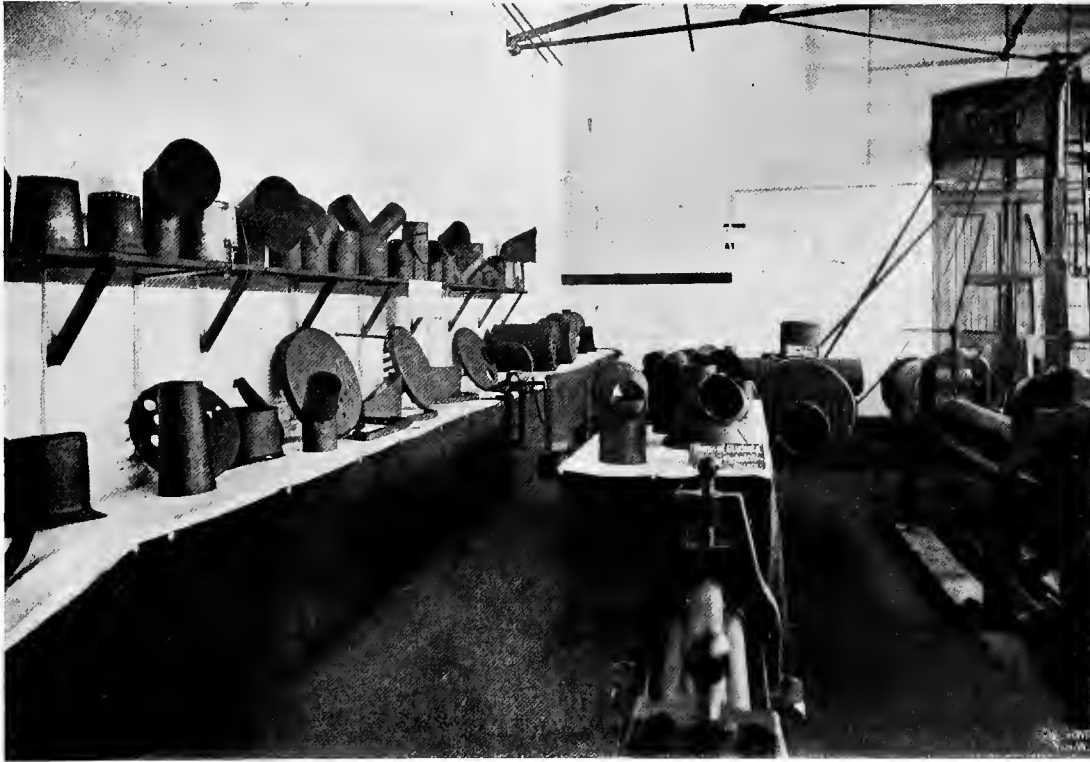


MECHANICAL ENGINEERING DEPARTMENT: TESTING MACHINES
100 TONS AND 20 TONS.



ANNUAL EXHIBITION OF STUDENTS' WORK: ENGINEERING DEPARTMENT.

Technical College student—Tools are not allowed to be “hung up on the floor” and so lost in the dirt, as is done in many a Sydney workshop, there is a place for everything and it must be put in its place when done with. The latest change in the iron foundry at the College is a valuable object lesson to Sydney ironfounders—the whitewashed ceiling reflecting and diffusing a good light just where it is required, viz., on the floor. The new applied mechanics lecture-room, which is in close proximity to the workshops, is also a great improvement. In regard to equipment—the late addition of the electrically-driven compressed-air hammer, with long stroke, in the blacksmith's shop; the latest development in milling machines and side planer, in the tool shop; the improved twist-drill grinders, and milling cutter sharpener—all go to prove that the classes are kept up with modern improvements in mechanical engineering work. These not only benefit the student but enable the owners of local shops to see for themselves the



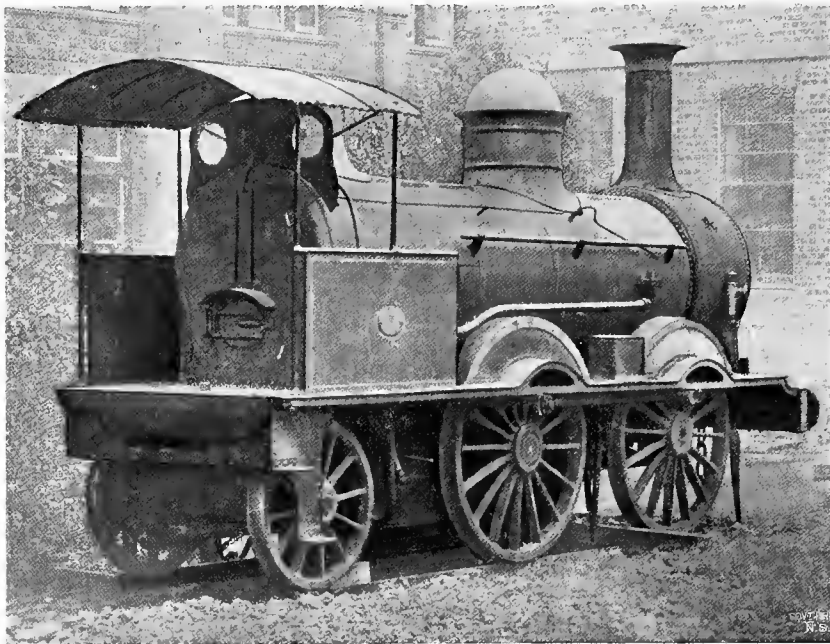
EXHIBITION OF STUDENTS' WORK: BOILERMAKING CLASS.

advantage of scrapping old gear, which gave but a poor return, and adopting these modern high-speed tools, and so help in the engineering progress of the State.

The remarkable progress of the workshops can be easily understood from the illustrations—the first (page 215) being the Kent-street workshop in 1885, with an equipment of two foot-lathes and a hand-shaper! the others (pages 210 and 211), showing the large and well-arranged shop of to-day. The College possesses many examples of science progress—we have the oldest Watt engine in the world, with sun and planet motion; at the same time we have a triple-expansion surface-condensing engine (made at the College) of about equal power, occupying a fraction of the space, the connecting-rod of the Watt engine, weighing twice as much as the complete modern marine engine. There is also an exact copy of Murdock's locomotive to be compared with No. 1 locomotive of New South Wales Railways, which, though only fifty years



EXHIBITION OF STUDENTS' WORK: PATTERNMAKING CLASS.



NO. 1 LOCOMOTIVE ENGINE.
(First Engine run in this State).

old, is very crude to modern ideas. From a copy of Hero's engine of 2,000 years ago, till "to-day," seems a long time; but the present modern "Laval" engine, of which the College has an example, is identical with Hero's in every respect, with this exception: Hero having but very low boiler pressure at his command, only gave "motion" with practically no "power," whereas the "Laval" is used for driving high-speed machinery. Thus it can justly be said of the College teaching that, though honoring the past, and showing what has been done in days gone by, every endeavour is made to keep abreast of the world's progress.

PROGRAMME OF CLASSES.

DEPARTMENT OF MECHANICAL ENGINEERING (EVENING CLASSES).

OWEN BLACKET, Lecturer in Charge of Department.

MECHANICAL DRAWING—Benjamin Bourke, J. N. Downward, and W. D. Massey, Monday to Friday, 7 to 9 p.m.

APPLIED MECHANICS—Owen Blacket, 1st year, Tuesday, 7 to 8 p.m., and 2nd year, Thursday, 7 to 8 p.m.

BLACKSMITHING—Peter Griffiths, Monday, Tuesday, Thursday, and Friday, 7 to 9 p.m.

PATTERN-MAKING—W. A. Phillips, Tuesday and Thursday, 7 to 9 p.m. A fair knowledge of Mechanical Drawing is an essential qualification for admission to the Pattern-making class.

BOILERMAKING—F. Buddle (Practical), Wednesday, 7 p.m., and (Theoretical), Friday, 7.30 to 9 p.m.

FITTING AND TURNING—J. Hanley—S. W. Stocker, Monday, Tuesday, Wednesday, Thursday, and Friday 7 to 9 p.m.

IRONFOUNDING—G. J. Pitt, Tuesday and Thursday, 7 to 9 p.m.

SLIDE RULE—F. E. Stowe, Tuesday, 7 to 9 p.m. Fees, Senior Scale.

MOTOR DRIVING—A. H. Sproule, Tuesday, 8 to 9 p.m. Fees, Senior Scale.

FITTING AND TURNING—Special day classes for a limited number, Monday to Friday, 2 to 4.30 p.m. Fees, Juniors 4s., Seniors 8s. per term for each lesson taken per week.

Department of Printing and Lithography.

COMPOSING.

(By J. V. BARKER, Teacher of Composing.)

THE several branches of printing and the allied industries have many things in common, and much of the success desired for the "Art Preservative" is dependent upon collective results. It is very essential, therefore, that each section of this far-reaching combination should benefit in the good accruing from technical education, and it is satisfactory to record that in a great

measure this desideratum is being met at the Sydney Technical College, though it yet remains to inaugurate a class in the interests of bookbinding. With this class in operation, and all the departments brought together in one room, or at least on one floor, the advantages that would be derived from such an association would be great and varied, and lead to a comprehensive understanding of technicalities—the allied trades thus receiving an impetus that is all the more necessary in view of the rapid changes that are taking place in the means of production.

In a communication to the writer, the Government Printer of New South Wales (Mr. W. A. Gullick) wrote:—"There is no room for doubt of the effect of technical teaching in the near future. The next generation will be very much better off than the present; in fact they scarcely realise how much is available to them, compared with the facilities which were at the disposal of the men with whom they are just commencing to compete."

The late Mr. F. Bridges, who was the first Superintendent of the Sydney Technical College, soon realised the necessity for extending operations, and amongst other industries that of printing came up for consideration, through representations being made by the Master Printers of Sydney "as to the necessity for providing technical instruction for those lads and apprentices connected with the printing and allied trades."



**STAFF OF THE DEPARTMENT OF PRINTING
AND LITHOGRAPHY.**

From left to right—

Front Row: Mr. Barker, Teacher of Composing; Mr. De Wilde, Teacher of Machining.

Back Row: Mr. Andrews, Lithography; Mr. Martin, Photo-Engraving.

It was not, however, until shortly after September, 1901, that applications were invited by the Public Service Board for the positions of instructors in composing and machining. There were twenty-three applications for the former position and eighteen for the latter. Messrs. W. A. Gullick (Government Printer), C. Batson (Batson & Co., Ltd.), and J. A. Burke (hon. secretary Printers Overseers' Association), were appointed to draw up examination papers and conduct theoretical and practical tests for the positions, the outcome being the appointment of Mr. J. V. Barker as teacher of the Composing Class, and Mr. W. S. De Wilde as teacher of the Machining Class.

Mr. Barker served his apprenticeship with the old Caxton Office of this city, of which he eventually became overseer. He was afterwards with Gibbs, Shallard & Co., with whom he stayed until their business was destroyed by fire. He then secured a position with the

firm of W. E. Smith, and remained with it for fourteen years. An opportunity offering, he transferred his allegiance from jobbing to newspaper work, and became associated with the *Sunday Times* Newspaper Co., Ltd., two years ago. The joint experience thus gained serves him in good stead—for the young newspaper idea as well as the jobbing one is being taught "how to shoot" at the class.

Mr. De Wilde was apprenticed with Spottiswoode & Co., London, and afterwards became associated with Waterlow Bros. and Layton of the same city. A later period found him installed in Reader & Co.'s Multi-colour works. In the *Illustrated London News* and *Strand Magazine* he received a thorough training in the system followed on those high-class periodicals, which paved the way for his acceptance of the position of half-tone printer on the *Sydney Town and Country Journal*. Four years later he was appointed to the charge of the joint room, where are printed that journal and the *Evening News*, which position he still occupies.

The promise of Mr. Perry, the then Minister of Public Instruction, that there should be no cheeseparing in respect of plant, has been adhered to, and it is only the want of space that would hinder a much greater number being accommodated if the necessity arose. The classes are certainly cramped for room, as the temporary building that is occupied was erected hastily in the College grounds; but Mr. J. W. Turner, the present Superintendent of the College, holds out every encouragement that this drawback will be removed in the near future, and there is then a possibility that the scheme promulgated at the commencement of this article—viz., all the allied classes brought together—will assume tangible shape.

The course of instruction outlined by the teachers was based upon that followed by the City and Guilds, London, but has been varied from time to time—fashions changing in printing as in other things.

Students are considered individually, and their ability be it great or small is exercised to advantage; thus it is possible to make competent craftsmen of all even if some fail to become expert.



SYDNEY TECHNICAL COLLEGE—PRINTING (COMPOSING) CLASS.

The success that is achieved by teacher and students is helped very materially by the fact that only those already occupied at the trade are permitted to attend. No good could accrue to anyone outside the trade joining the classes with the idea of bettering themselves, for the little knowledge gained would be of no practical benefit. It is contended that with the course of College tuition alone (restricted to three years), it is impossible to make competent tradesmen, for there must be constant practice of years' duration, and it is the experience of most, that the seven years' apprenticeship is all too short to fit a boy to follow the profession of a compositor with the success that is necessary, if we are to raise the status of the trade and make it more worthy of the designation "the Art preservative of all Arts." How could that desideratum be possibly achieved with a three years' course of College attendance, each year represented by eighty-four lessons of two hours duration, practically one-half of which are devoted to theory, when a type is not touched, but in which other principles are taught quite as necessary, but so much neglected by the craft, to the detriment of the individual and trade?

It is much to be regretted that employing printers do not insist upon their apprentices giving at least three years' attendance at a technical college, for by so doing they would help to raise a class of good workmen, to their own benefit. It is essential that a compositor should know more than the "type-snatching" of the old days, for, since the usurping of all solid setting by the type-setting machines, it has become imperative that the craftsman should make himself conversant with the intricacies of display work. It is the "master handling" of type that is necessary—not so much the mere setting, as the artistic grouping and arranging of the various components forming a carefully thought-out piece of type composition.

In presswork, also, how much more necessary it is for a craftsman to know the trade than was the case formerly! The introduction of art papers and half-tone illustrations has opened up possibilities unknown a decade ago; and the three-colour process, too—where a shade of ink this way or that makes or mars. A technical class affords opportunities to delve into the "art and mystery" of these subjects, and to understand the why and wherefore of them; also to become acquainted with the intricacies and minute adjustments of modern presses, which demand craftsmen of finer calibre and higher education than was generally associated with the earlier times.

Melbourne led the way in the matter of establishing technical printing classes, and Sydney has not taken any second place in the position it has given its classes; likewise there is not the least doubt that Sydney will be ready to again follow the lead of Melbourne in the matter of all-time instructors, so soon as representations are made as to the necessity of such procedure. That there is a necessity, if the due meed of success is to be reached and we are to keep abreast of those with whom we are called upon to compete, there is no reason to doubt.

To hie back to the time when the printing and allied trades were first identified with the Sydney Technical College, it is necessary to state that the 8th of April, 1890, may be said to have been the actual date upon which printing was inducted at the institution, Mr. A. A. Lawson being then appointed teacher of the contemplated lithographic class, a position he held with much distinction until the 28th February, 1906.

A rapidly growing process-engraving business demanding increased attention, this popular and successful teacher was reluctantly compelled to relinquish a work he was intensely interested in, but as, in addition to lithography, he also taught collotype printing, photo-lithography, and photography, it is to be marvelled at that he for so long found the time necessary for so multifarious a group.

The outcome of the relinquishment of these duties of teaching by Mr. Lawson was the commencement of a new era.

Photography was given scope, increased support was called for, and a separate class devoted solely to this far-reaching industry and pastime was inaugurated under the guidance of Mr. R. H. B. Brangwin.*

A most important branch of the allied trades, and one that has grown to huge dimensions, is photo-engraving and process work, another offshoot of the lithographic class. It was thought advisable, in the interests of this constantly increasing trade branch, to provide a special teacher, inaugurate a special class, and have increased accommodation to adequately cope with the many applications that were made for tuition in this modern means of producing blocks for illustration purposes.

* For notes as to this separate class, see page 271.

Mr. E. J. Martin was appointed to the position of teacher. He is a partner in the firm of Bacon & Co., Pitt-street, City, and derived his experience of the trade in the Mother Land and on the Continent. His apprenticeship with the Meisenbach Co., London, gave him opportunities of acquiring a sound knowledge of his business, which was further added to as a journeyman with the same firm. For further experience he exploited the Continent, and among other firms he was with that of Jean Malvane & Co., in Brussels, which has an enviable name for high-class colour work. 1902 saw him again in London, where he joined the engraving department of George Newnes, Ltd. In 1904, Mr. Martin was at the antipodes in charge of the engraving department of the *Auckland Weekly News*, and 1906 saw him a partner in the firm first mentioned above.

The lithographic class, thus shorn of its many appendages, has now for its teacher Mr. A. Andrews, who, during his apprenticeship with S. T. Leigh & Co., Sydney, attended a three years' course of the class over which he now presides. During his studentship he secured honours in lithography, and passed first grade in photo-lithography, &c., at the examinations. To the groundwork he thus received, he attributes much of the success he has achieved both as craftsman and overseer. His appointment as teacher dates from February of the present year, and was the outcome of an exhaustive examination.

Periodical visits are paid to the printing classes by the Printers Overseers' Association and the Typographical Association, and both these bodies, together with the Machinists' Union, have donated prizes for competition amongst the apprentice portion of the students. The Government Printer, who is an ardent supporter of the classes, has likewise favoured in this respect, as have also several of the printers' furnishers.

When knowledge gained in the ordinary way in a printing establishment is supplemented by that obtainable in a technical class, the result is as beneficial to the employer as it is to the craftsman, and raises the standard of the work to that of the most finished product; this fact is emphasised where it enables students to compete successfully for positions offering that require ability and experience, and it is also emphasised when students obtain distinction in competitions open to the whole trade. In illustration of the former case, it may be mentioned that a three-years student of the composing class has been appointed to the charge of the printing department of a firm of wholesale druggists, while others have improved their standing considerably as craftsmen through their attendance at the College. In the second category Orchard Clark stands out prominently amongst those who have achieved distinction. His record is one of even excellence, having obtained honours at the examination in each of the three years of his attendance. During his second year he entered in a competition arranged by the *British Printer*, open to all compositors in the Colonies, and obtained third place in a list comprising fifty-one names—although only an apprentice. There were nine entries from the Sydney Technical College, and the positions obtained were 3, 10, 16, 17, 23, 24, 27, 28, 38. Eight (apprentice's work) of the nine specimens submitted were also considered in a separate competition by the local Printers Overseers' Association, who awarded Clark second place. This body again offered prizes for 1908 to the students of both classes (apprentices) and submitted "copy" for a membership card. Six competed, and Clark was adjudged the winner of the composing section, and E. G. Baker of the machinery section.

In the *British Printer* Colonial competition the points awarded for presswork of the specimens sent from the classes by the *British Printer* authorities, were out of a possible five points—two 5's, five 4's, and one 3.

MACHINING.

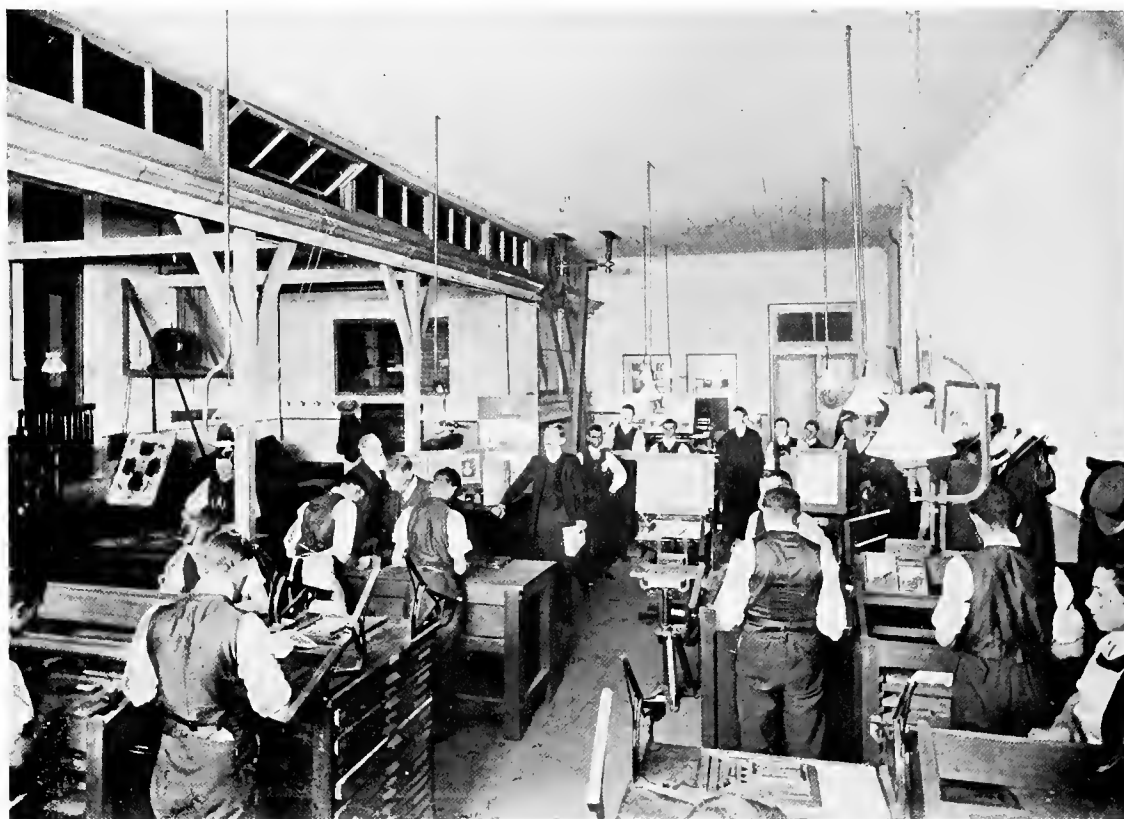
(By W. S. DE WILDE, Teacher of Machining.)

"THOU hast most traitorously corrupted the youth of the realm in erecting a Grammar School, and whereas before our forefathers had no books but the score and the tally, thou hast caused printing to be used, and contrary to the King, his Crown and Dignity, thou hast built a Paper Mill."—*King Henry VI.*

A Circumstance! To what minor happenings do we attribute the tremendous advance of education among the masses? It may be said that Gutenberg, by the seemingly small

circumstance of discovering an easy method of obtaining a multitude of impressions at a cost within reach of the middle classes, solved the problem of universal education, and placed it on the market for all who had the enterprise and cared to advance. Advancement has never hitherto been encouraged to the extent that appertains in this century; primary schools, colleges, technical colleges, and universities vie with each other in disseminating the knowledge which was denied to our forefathers, and out of the vicissitudes and battles of our ancestors the world has advanced in a greater measure by reason of the Art of Printing, than by any other method. Knowledge, hitherto in the hands only of the learned ecclesiastics and old professors of sciences, became suddenly unlocked, and the whole vista of intellectual superiority was laid bare to all that had the means and power of absorption. Learning was no longer a secret, wrapped up in a person, but from our ancestor has emanated a glorious heritage—namely, Technical Education.

Technical Education is paramount in importance, but must be laid upon a foundation of sound primary training in the Public Schools. Literature, an important profession, should



MACHINING CLASS AT WORK.

and does hold in its ranks some of the most eminent men and prominent scholars of the world—statesmen, authors, and professional men of all degrees; and how much need has the printer of the present day to improve and technically educate himself so as to intelligently and forcibly support these master minds in the portrayal of ideas and circumstances before the world!

The Printing classes of the Sydney Technical College aim to elevate not only the craftsmanship but the personality of the students. The writer, as a close observer of the young student, is pleased to note that since the inauguration of the classes in 1907, the personnel and primary education of the students has improved tremendously, and, therefore, the craftsmanship displayed is the more marked by this elevation.

The Press student I would in particular enlarge upon, as owing to the tremendous advancement of printing during the last twenty years the major burden of "rising to the occasion" has been with him. Modern printing presses, to the uninitiated are "fearfully and wonderfully made," and the intellectual quality required to successfully run and manipulate these complicated masses of mechanism is not small.

Illustration work at the present time, obtained by photographic and mechanical means, requires infinite study and pains; and only those students who apply themselves very closely to their work may hope to win through to a position in the printing profession.

The students of the Sydney Technical College Printing classes (Press branch) are very enthusiastic in their work and have attained high places in British and Colonial competitions; and what is perhaps more to the point, succeeded in obtaining appointments at a good salary in other offices, viz., two students to Queensland, one to New Zealand in charge of illustrated work, and one to a position in the Imperial Government service, all of whom have been reported by their chiefs as being eminently satisfactory.

The plant installed in the Press section consists of an up-to-date double royal stop-cylinder press, supplemented by an Art Phoenix platen press, a Commercial Phoenix platen, an Arab platen, and an Albion hand-press. In addition to these presses may be mentioned a perforator, cutter, and wire-stitcher.

The fine show-case in the centre of the room, equipped by the New South Wales Government Printer (Mr. W. A. Gullick) and the writer, contains specimens of all kinds of printing plates and type, from the initial stage to the finished article, which create great interest in the minds of the lay visitor, and help exceedingly the observant student in pursuit of knowledge.

The classes are now overflowing and awaiting a change to new quarters when better work still will be possible, and with the co-operation of the controllers of the printing profession in Sydney, the Press section of the Printing classes of the Sydney Technical College has still further fields to conquer, and will be assured of still further success in future.

LITHOGRAPHY.

(By A. ANDREW, Teacher of Lithography.)

THE nature of the work done in the Lithography class follows out, as far as possible, what an all-round journeyman would be called upon to perform in a first-class office, in conjunction with a thorough theoretical training in all matters appertaining to lithography. The students have an opportunity of carrying out a chromo-litho.—from polishing the stones ready for the artist, through all branches of proving, &c., to the finished machine proof. In addition, instruction is given in copper-plate work, engraved stones, the zinc and aluminium process, making transfer papers, inks, and all accessories in working the various processes. In these days of experts in one branch of a trade only, the students have opportunities placed before them which may never occur in a workshop.

In addition to the lithographic printer, the class offers excellent facilities for young lithographic artists to be instructed in the technical portion of lithography, also to work out and have lithographed any original design or drawing.

The present teacher is an ex-student of the class.

The class is equipped with an up-to-date plant, complete in every detail, and consists of one copper-plate press, one demy and one double crown litho. hand-press, and one demy Furnival machine with all the latest improvements, driven by a direct-gear electric motor; also a large stock of stones, aluminium plates, acid baths, &c., necessary to carry out all classes of lithographic work.

PHOTO-ENGRAVING.

(By EDWARD J. MARTIN. Teacher of Photo-Engraving.)

OWING to the dearth of skilled labour in the Photo-Engraving trade it was decided to form a Photo-Engraving class at the Sydney Technical College to enable students to get a thorough practical and theoretical knowledge of the craft. Through the results of their studies several students have gained a high state of competency and been able to get a considerable increase in salary; and one (Harold Skiller) has received a good position as operator with Messrs. S. W. Bacon & Co., of this city.

The class-room is fitted up with all the modern plant and appliances necessary for demonstrations and the production of line, half-tone, and three-colour blocks. A Penrose process camera, Cooke lens and prism, Levy ruled screen, spring camera stand, and a pair of powerful arc lamps figure amongst the valuable plant installed. Leading from the class-room is a spacious dark-room, fitted for the requirements of wet and dry plate negative making.

As the Photo-Engraving trade consists of three distinct branches, viz.—(1) Line and half-tone negative making; (2) Printing from negatives on to metal, line and half-tone etching, engraving and proofing; three-colour block making—it has been found advisable to split the class up into three sections. No. 1 section receives instruction in line and half-tone negative making by the wet and dry plate processes; a course on photographic chemistry, and a course



PRINTED FROM A BLOCK PREPARED BY A STUDENT IN THE PHOTO-ENGRAVING CLASS.

of lectures on lenses and screens, regular and irregular. No. 2 section is taught printing on to zinc and copper by various processes, the use of different mordants, line etching, half-tone etching, fine etching with brush work, and tool engraving. No. 3 section is instructed in spectrum analysis, three-colour negative making by the direct and indirect methods, the use of aniline dyes as applied to dry-plate bathing, collodion emulsion, its uses for three-colour and isochromatic reproduction.

The illustration shown is printed from a block prepared in the class by one of the students.

PROGRAMME OF CLASSES.

DEPARTMENT OF PRINTING AND LITHOGRAPHY.

PRINTING—Composing—J. V. Barker, Monday and Wednesday, 7 to 9 p.m.

Machining—W. S. De Wilde, Monday and Wednesday, 7 to 9 p.m.

To qualify for examination, a Student must attend not fewer than 60 lessons (Theory 20, Practice 40).

LITHOGRAPHY—A. Andrews, Monday and Wednesday, 7.30 to 9 p.m.

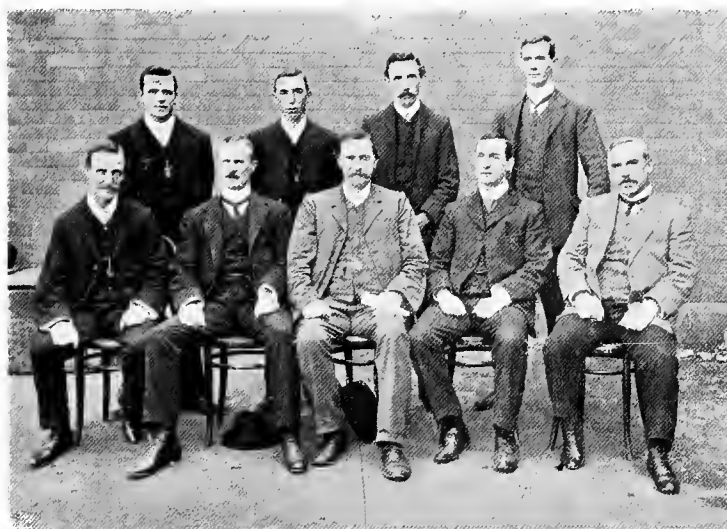
PHOTO-ENGRAVING—E. J. Martin, Tuesday and Thursday, 7 to 9 p.m.

Department of Sanitation.

(By JOHN L. BRUCE, Member Royal San. Inst., Lecturer in Charge of Department).

THE INCEPTION OF THE DEPARTMENT.

THE Department of Sanitation, like the science which it is its object to teach, is of comparatively recent origin, and like that science it has grown enormously since its inception. It was only at the beginning of the year 1891 that Sir Joseph Carruthers the then Minister for Education, acting on the recommendation of the late Mr. Frederick Bridges, who was at the time Superintendent of Technical Education, appointed the present Lecturer-in-charge to create the new



STAFF OF THE DEPARTMENT OF SANITATION.

Reading from left to right :

Front row—Mr. Nelson, Chief Teacher of Plumbing; Mr. Stewart, Professor of Veterinary Science, Sydney University, Lecturer in Meat Inspection; Mr. Bruce, Lecturer in charge of Department; Dr. Sinclair, Medical Officer of Health, Lecturer in Sanitary Law, &c. : Mr. Gray, Assistant Chief Teacher of Plumbing.

Back row—Messrs. Lawson, Auld, Patino, and Malcolm, Assistant Teachers of Plumbing.

department. The growth of the department is well shown by the fact that while at the time of its establishment (eighteen years ago) the student enrolment totalled only thirty-seven, of which thirty were attending the practical plumbing, now it has increased to about 400, of which number 300 are attending the practical plumbing classes. This phenomenal growth indicates at once the need for the classes, and the marvellous increase in the public estimation of the importance of education in matters sanitary.

When the writer, eighteen years ago, entered on the task of formulating a scheme of efficient instruction in the various branches of sanitation, he realised that, in order to suit the wants of the Tech-

nical College, and of the times, it would be necessary to deal with two main sections of students:—*First*, cadets in what might be called the professional callings, such as municipal engineers, sewerage engineers, water engineers, and architects. *Second*, the trades section, comprising the practical plumbing and gasfitting trades.

At that time very little was known in Australia of sanitation in its modern sense. The main pipes of the new Nepean water supply were completed, and also the main carriers and outfalls of the new Sydney sewerage scheme, and the Metropolitan Water and Sewerage Board had just been called into existence to administer those services, but practically nothing had been done in connecting the new services to the houses, or introducing modern methods and fittings. To those who, like the writer, have witnessed the gradual discovery and exposure of the frightfully insanitary work then existing, aye, and then being done every day by many of the master plumbers in Sydney, and passed as satisfactory by the architects, it is no exaggeration to say that the task before the professional staff of the Water and Sewerage

Board and the teachers of the new Sanitary Department was nothing less than the education of the great body of the architects, the master plumbers, and the journeymen, and incidentally, the general public, in the veriest elements of modern sanitary work.

It is true that for some years before the constitution of the Sanitary Department a practical plumbing class had been in operation, but although good work was done in the training of students in lead working, as it was then understood, that was a very different thing from the lead work as now taught and practised. As for the teaching of the theory of the subject, that is the sanitary, hydraulic, and pneumatic principles underlying the proportioning and arrangement of pipes and fittings, that was unknown, and was indeed at that time sneered at, by the majority of those who prided themselves on being "practical men."

From the first, the Sanitary Department was nobly supported and encouraged by Mr. Smail, the Engineer-in-Chief of the Water and Sewerage Board, who was at that time Engineer for Sewerage to the Board; and the great success which has undoubtedly followed the teaching given in this department is unquestionably due very largely to Mr. Smail's unswerving support. This support, by compelling architects and plumbers alike to learn and to practise the principles and workmanship of modern sanitation, has enabled the Water and Sewerage Board and this department to stand firmly against, and fight down inch by inch, the ignorance and prejudice of the past, until now Sydney is recognised, and quoted all over the world as furnishing an example of plumbing and general sanitary work which is unequalled in many, and surpassed by none, of the great cities anywhere.

That is a great result to be attained in eighteen years, but its reality is undeniably proved by the best of all evidence, that of the regular and enormous decrease in the death-rate, which has followed the work.



THE SANITARY ENGINEERING LECTURE-ROOM.

Mr. Bruce lecturing to the Sanitary Inspectors' Class.

THE GENERAL SCHEME OF INSTRUCTION.

The general scheme of instruction as formulated by the writer in 1891, and since continued, consists of:—*First*—Sanitary Engineering Lectures—These were divided into three courses, dealing with separate branches: A course—which deals with lighting, heating, cooling, and ventilation; B course—giving instruction in hot and cold water supply and water supply fittings, and also the designing and proportioning of sanitary fittings, such as baths, basins, water closets, &c., and of the pipes carrying the sewage from those fittings, and finally the disposal of the sewage by septic tanks and bacteriological filters; C course—dealing mostly with the municipal engineer's work, such as the designing of the water supply and sewerage of cities, water waste prevention, disposal of sewage, garbage, and night-soil, municipal disinfecting plant, road-making, and street-lighting. Courses A and B were intended more for architects and such plumbers as wished for fuller information on those subjects, beyond that they could obtain in the sanitary plumbing lectures; while course C, in conjunction with courses A and B, was designed for the instruction of cadets, &c., in the offices of engineers dealing with the branches named. *Second*—Sanitary Plumbing Lectures—Dealing in a more elementary way with the subjects taught in course B, and also including the nature and composition of the metals and solders, fluxes, &c., used by plumbers, the principles of cutting out coverings, and the dimensions, weights, and arrangement of pipes and fittings as required by the Water Supply and Sewerage Board;—*Practical Plumbing Classes*—wherein was taught the handicraft work of the plumber.

The foundations of this tuition had been laid by the writer some three years previous to the initiation of the Sanitary Department, in a course of fortnightly popular lectures on sanitary subjects, extending over a year, which he delivered for the old Board of Technical Education, in the School of Arts Hall in Pitt-street.

These lectures were very fully reported in the daily papers at the time of their delivery, and many students who afterwards joined the classes have informed the writer that it was from them that they first derived any idea of the scope of sanitation, and had their appetites whetted for further instruction in the subject.

THE SANITARY DEPARTMENT EXAMINATION BOARD.

Within a year after the initiation of this Department, the Water and Sewerage Board, acting on the advice of Mr. Smail, their Engineer, took a step which has had far-reaching influence, not only in increasing the attendance of students in the Sanitary Department, but also in the interests of the public health. This was their request: that the Lecturer in charge of the Department of Sanitation should undertake the examination of those desiring licenses from the Board to do work as plumbers, as water-fitters or as drainers, in the districts under their control. Mr. Bridges, the then Superintendent of Technical Education, realised at once the benefits which this step would entail, not only to the College classes but to the public, and so fell heartily in with the request. The writer, however, did not think it advisable that he alone should be the examiner; and the matter being left in his hands, he organized a Sanitary Department Examining Board, which was authorised to issue diplomas as master plumber, and certificates as water-fitter and as drainer. These diplomas and certificates were required by, and qualified for licenses under, the Metropolitan Water and Sewerage Board, and since then have been recognized as qualifying for a license in Newcastle, Melbourne (Victoria), Wellington (New Zealand), and also in all towns throughout this State, where the water supply has been constructed by the Government.

The Metropolitan Water and Sewerage Board stipulated that those examinations should be open to all tradesmen, whether attending the Sanitary Department classes or not, but in the then state of knowledge in the trade the examination led to an immediate and great increase in those attending the Sanitary Department classes, because those who failed to pass (and for the first few years those formed a large proportion) immediately joined the practical or theoretical classes, or both, in order to qualify. Since the inception of those examinations hundreds of candidates have qualified, and the holders of those diplomas are now to be found all over the world testifying by their skill to the wisdom of the act, and to the efficiency of the training which most of them have received at the Sanitary Department classes. This Board as now

constituted is thoroughly representative in its personnel, consisting, as it does, of the Lecturer in charge of the Department as President, assisted by the chief teacher of practical plumbing, and by honorary members, representing the Water and Sewerage Board, the Master Plumbers Association, and the Operative Plumbers Society.

As the work of the Metropolitan Water and Sewerage Board extended, it became necessary to create a body of qualified inspectors to superintend the house connections (drainage) and the sanitary plumbing work in connection with the water supply and sewerage of the city.

Again this Board enlisted the assistance of the Sanitary Department to select, by examination, the fittest of the candidates applying for the positions. This was done, and, as might have been expected, the majority of those selected as best qualified, were candidates (many of them men well up in years) who had been assiduously improving their knowledge and skill by attendance at the Sanitary Department classes. As a result, a large proportion of those inspectors under this Board, from the Chief Inspector downwards, are past students in this department, and it is satisfactory to record that the Sanitary Department has also furnished plumbing inspectors both to the Newcastle Water and Sewerage Board, and the Metropolitan Board of Works in Melbourne, Victoria.

THE WATER AND SEWERAGE BOARD GOLD MEDALS.

About this time the Metropolitan Water and Sewerage Board, again acting on Mr. Smail's advice, instituted the annual presentation of two valuable gold medals, one to the best student in the final (C course) year of the Sanitary Engineering course, and one to the best student in the fourth year, or advanced class, in Sanitary and Practical Plumbing. Those medals it is the great ambition of the students to obtain. The Sanitary Engineering medal, because its holder always receives special consideration when promotion is in question in the Metropolitan Board; and the Plumbing medal because it is only the very best of the plumbing students who can hope to obtain it, and it is, therefore, looked upon as the "blue ribbon" of the trade.

THE SANITARY INSPECTORS' CLASSES.

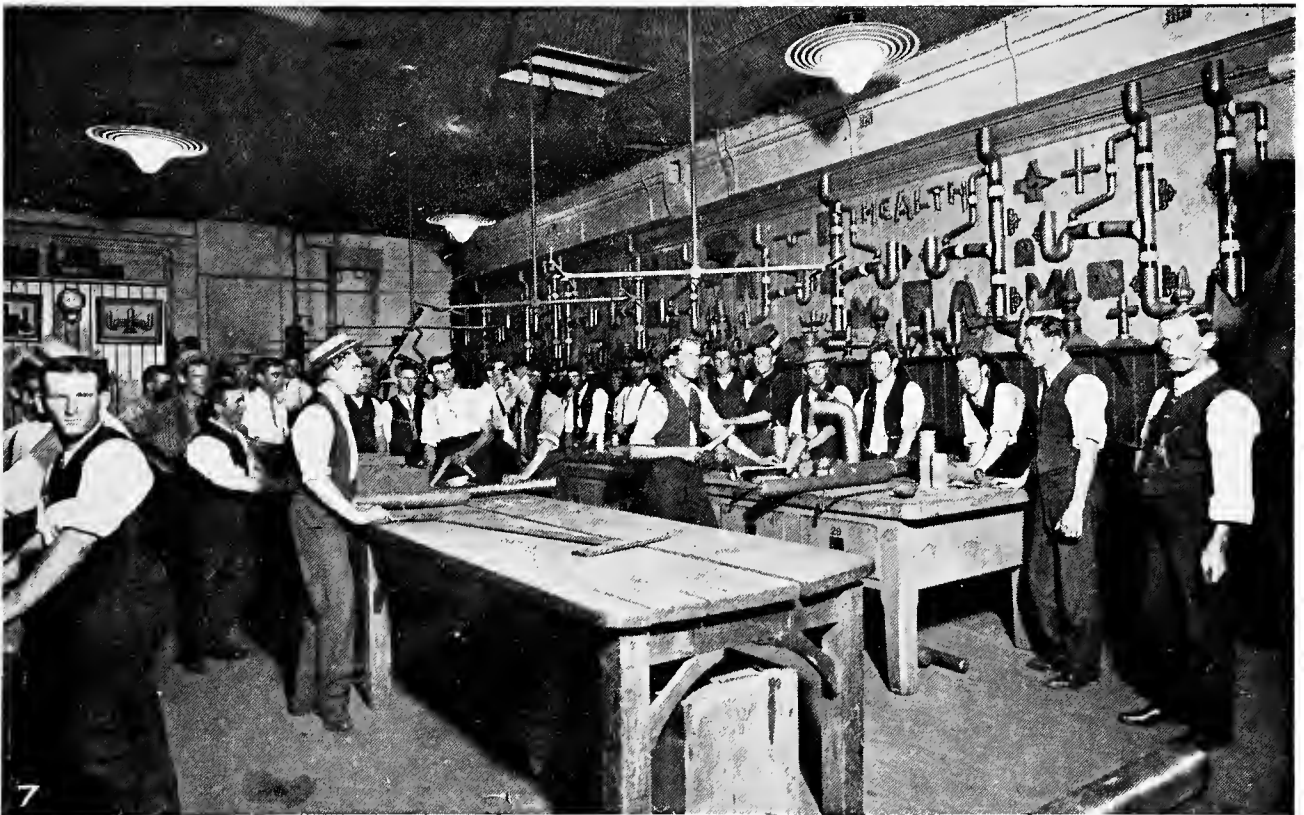
At the time of the institution of this Department, qualified Sanitary Inspectors were unknown in Australia, but the outbreak of plague in Sydney in the year 1900 changed all that. When the outbreak took place and drastic measures became urgently necessary, the President of the State Board of Health, Dr. Ashburton Thompson, applied to the writer to nominate as many students or ex-students as possible who had special knowledge of sanitation, and who were willing to undertake the work—most of the best of these, already held permanent positions, but about a dozen were made available at once, and those did yeoman service during the cleansing operations which accompanied and followed the outbreak. This led to the establishment of special classes under the department for the training of Sanitary Inspectors. The City Council led the way by calling on the writer for a course of lectures for the instruction of a large body of Sanitary Inspectors whom they proposed to employ. This request was acceded to, and the writer delivered a course of twenty lectures on the engineering side of the question, which were supplemented by special lectures delivered in the College by Dr. Armstrong, the District Medical Officer of Health, on the medical side of an Inspector's work. Shortly after this, a regular course of instruction for Sanitary Inspectors was drawn up by the writer, and a College Certificate as Sanitary Inspector was instituted. This calls for a year's course (D course) in sanitary engineering subjects, given by the writer; a two-term course in sanitary law, infection and disinfection, and food inspection; and a course of fourteen lectures on meat inspection, both given by qualified professional men; a two-term course in Physiology, and a year's course in building construction, and in architectural plan drawing by the College Lecturers in those subjects.

At this time the Royal Sanitary Institute of London, did Sydney the honor of selecting it as the first place outside of Britain wherein to conduct local examinations for their certificates as Nuisance (that is Sanitary) Inspectors, and for certificates in Sanitary Science, and a local Board of Examiners was nominated with Dr. Ashburton Thomson as President, and examinations are held annually, after the close of the Technical College examinations.

As all qualified Sanitary Inspectors in this State are now required to hold either the Royal Sanitary Institute certificate or the Technical College certificate, this has led to a large attendance of students at the Sanitary Department classes for Sanitary Inspectors. Most of those, including a number of ladies, have qualified, and hold either the College or the Royal Sanitary Institute certificate, or both, and it is safe to say that at the present day most of the Sanitary Inspectors now acting throughout this State are past students of those classes in this Department, and in addition, they have furnished the Chief Sanitary Inspector under the Queensland State Board of Health, the Chief Inspectors under the Tasmanian State Board of Health, The Chief Inspector under the Hobart (Tasmania) City Council, and several sanitary inspectors to various centres in the State of Western Australia.

THE PRACTICAL PLUMBING CLASS.

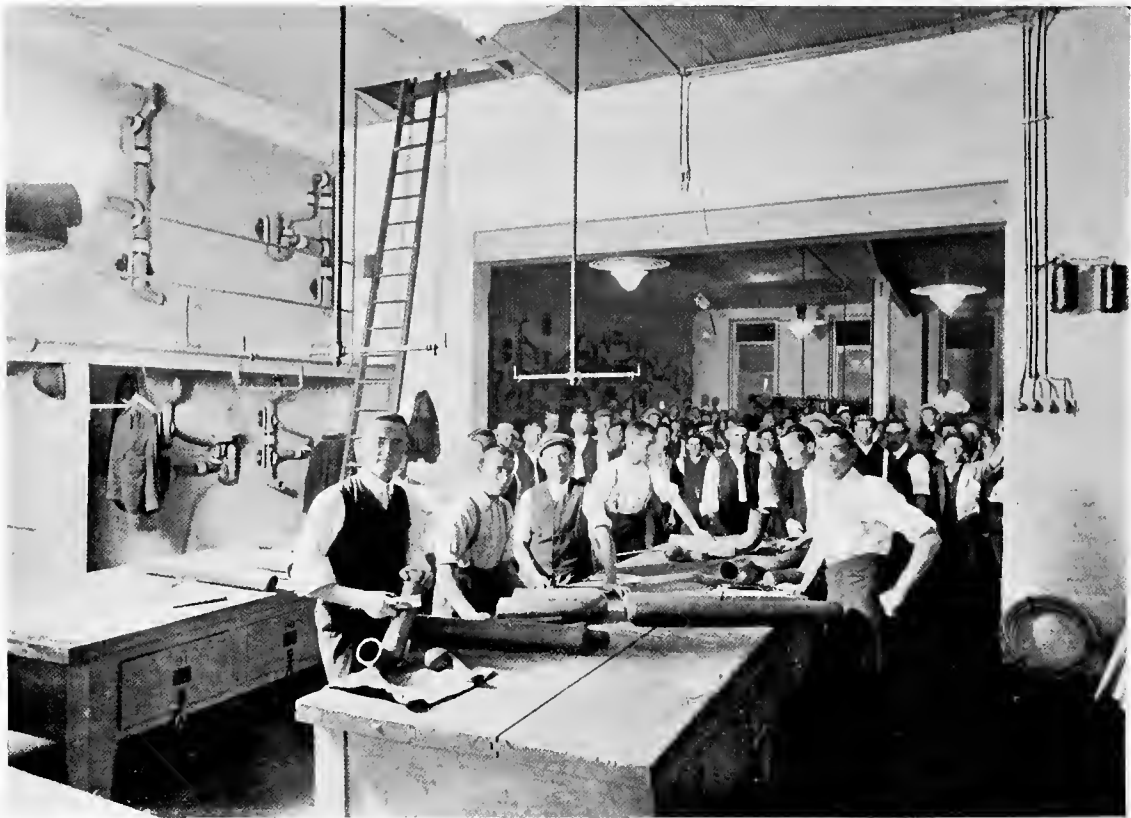
Turning now to the Practical Plumbing classes, here also the progress made during the last eighteen years has been phenomenal. As already stated when this department was constituted, the practical plumbing students numbered thirty, and the teacher, the late Mr.



ONE OF THE PRACTICAL PLUMBING CLASS-ROOMS.

Showing students' work on walls.

David Nelson, who was the father of the present Chief Teacher of Plumbing, had one assistant teacher, the late Mr. James Douglas, who, on Mr. David Nelson's death, was appointed chief teacher, with the present chief teacher as his assistant. At the present day the students number nearly three hundred, with a nightly attendance which often exceeds one hundred, and the teaching staff consists of Mr. William Nelson, the chief teacher, an assistant chief teacher, and five



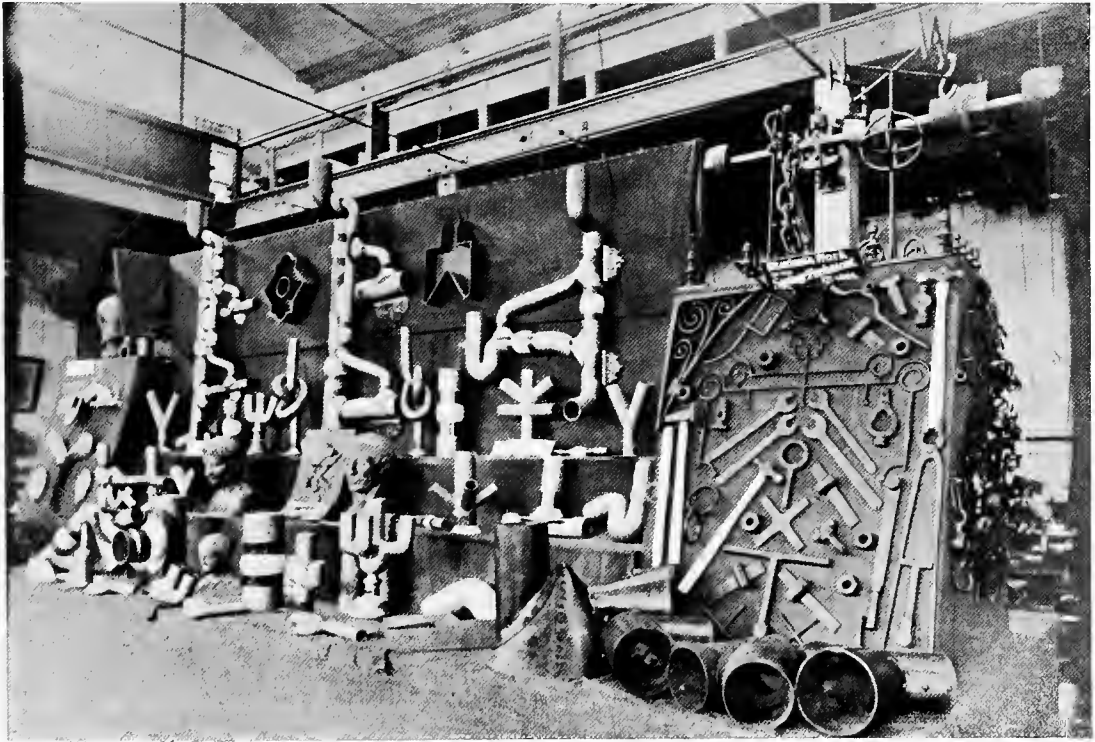
ANOTHER OF THE PRACTICAL PLUMBING CLASS-ROOMS
Students at work.



EXAMPLES OF SPECIAL BOSSING WORK.
Each wrought without seam from one flat piece of 6-lb. sheet lead.

assistant teachers, all of whom, excepting the chief assistant teacher, are ex-students, and the teachers of plumbing at Granville, Newcastle, and Goulburn are also ex-students. The work done is thoroughly up-to-date and has been acknowledged by well-known master plumbers from Britain, who have visited the class-rooms, to be equal to anything they have seen in Britain. Indeed, some of the lead-bossing work, as for example, the busts shown in the illustration (one of which was done by Mr. Lawson, one of the assistant teachers), and which have been worked up out of a flat sheet of lead, are in point of artistic merit and handicraft skill unique in the world.

An exhibit of lead work, an illustration of which is given, was sent to the great Exhibition recently held in Christchurch, New Zealand, and secured a special gold medal for its artistic



PLUMBING, BLACKSMITHING, AND BOILERMAKING EXHIBIT, N.Z. EXHIBITION, 1906-7.

and general excellence. It is most satisfactory to record that the authorities of the Christchurch Technical School specially requested that as many of the exhibits as could be spared should be left with them to serve as models for the students in their plumbing classes, which was, of course, done. A similar compliment was paid to the plumbing class by the authorities of the Brisbane (Queensland) Technical School, who asked and received a set of typical examples of students' work to show as models for the plumbing students there.

One pleasing feature in connection with the sanitary and practical plumbing classes, is the interest taken in them, both by the master plumbers and the operatives. Many of the former pay the fees for their apprentices to attend the classes; their association presents a gold medal annually to the best student in the third year, and the members frequently visit the classes. The illustration shown of the plumbing exhibit at the 8-hour Day annual procession in Sydney, is evidence of the approval of the Operatives Plumbers' Society, as that exhibit is sent by the College at their request as an example of what they consider to be first-class work.

ACCOMMODATION AND EQUIPMENT.

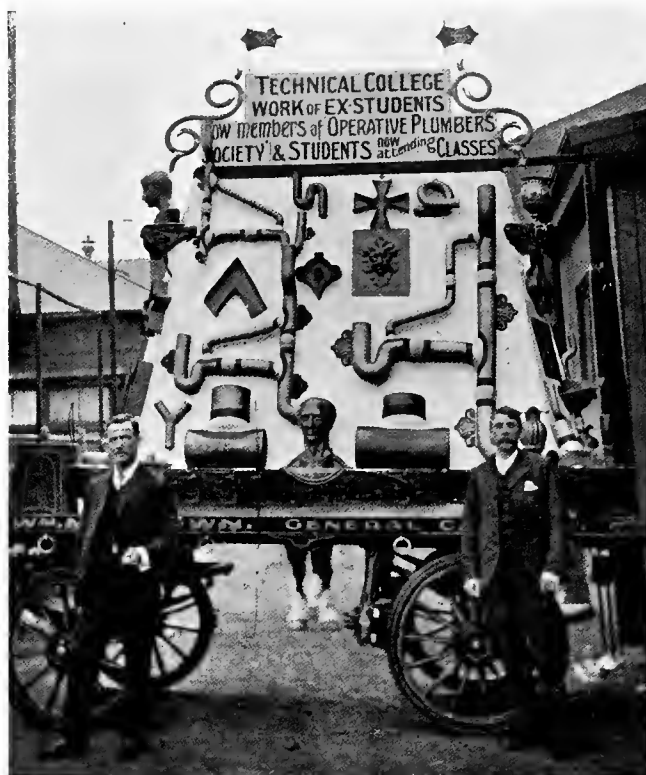
The accommodation and equipment provided for the Department of Sanitation at the Sydney College is clearly shown in the plans of the College published in this monograph, and in illustrations which accompany this article.

The lecture-room which is seated for seventy students has space along the sides for the exhibition of the models, &c., shown in the illustration, which are used for demonstration purposes.

The testing rooms comprise apparatus for showing on a practical scale the loss of head by friction through pipes, elbows, bends, stopcocks, &c. The action of hydraulic pumping rams under different driving heads, lifts, and length of drive pipe. The efficiency of hand pumps and power required under different lifts, and with different sizes of rising pipes. The flushing action of different quantities of water at different speeds through different closet pans, the action of various forms of syphon, the photometric measurement of various forms of gas burners, and the influence of gas pressure, the testing of the action and efficiency of gas water-heaters, working under different conditions, &c.

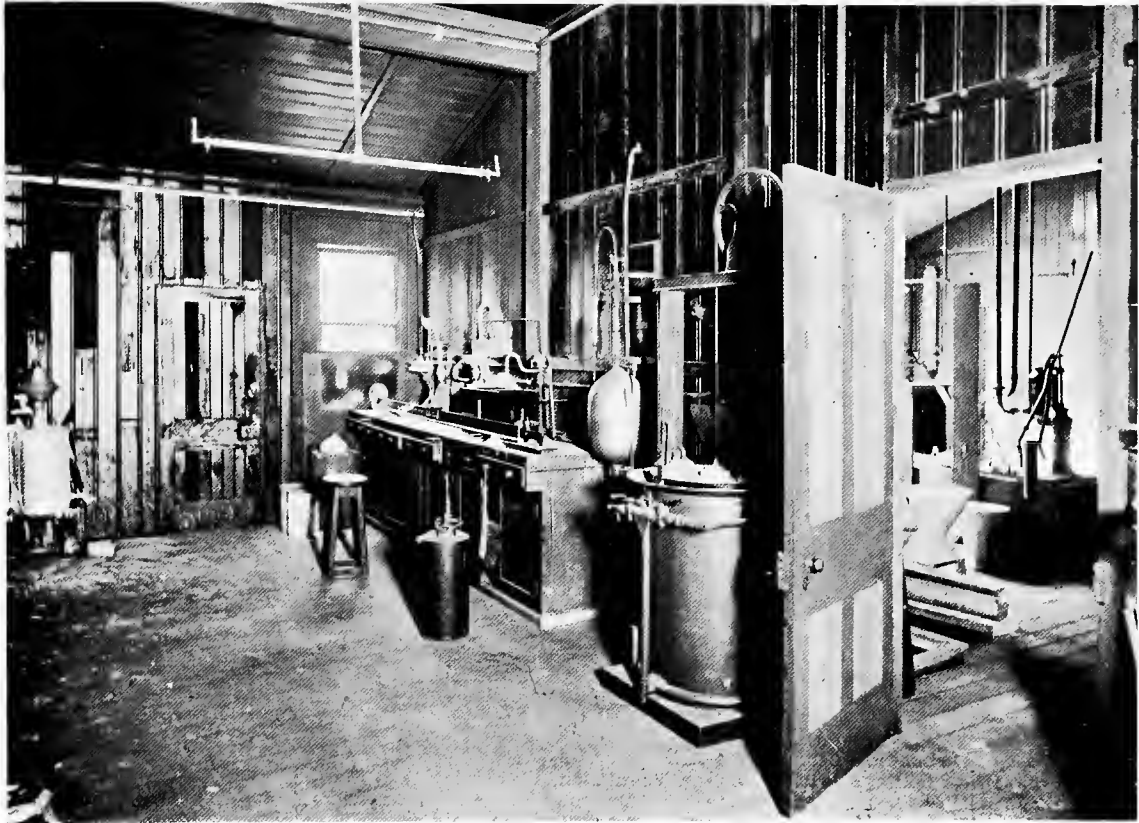
The illustration shows the photometer room, with a glimpse of the hydraulic testing room through the open door.

The plumbing class-rooms consist of three large rooms. The two illustrations of the classes at work are both taken from the entrance door looking left and right; one of those rooms is two stories in height divided into four stages, where stacks of soil and waste pipes, with



PLUMBING CLASS EXHIBIT AT THE EIGHT-HOUR PROCESSION.

Mr. Nelson, Teacher of Plumbing, and Mr. Boye, Plumbing Gold Medallist, for 1908, in front.



THE TESTING LABORATORY.

The Photometer Room and Glimpse of Hydraulic Testing-room.

appropriate fittings are fixed in position by the senior students. These rooms provide good bench room for 100 students, but as many as 120 are sometimes present. There are four large melting pots for wiping solder, and an ample supply of mandrills, dummies, &c., but the students provide their own smaller tools, as dressers, shavehooks, &c., which are kept by them in locked drawers. The lead used is melted up and re-rolled from time to time, the solder being first melted off as far as possible so that there is little waste of material.

DAY CLASSES.

The classes in this department mostly meet in the evening, but there are several day classes as well. On the Sanitary Engineering side, lectures are given to the day engineering students in their third year, on elementary sanitary engineering. Such subjects as may be useful to such of those as enter into municipal work, are chiefly dealt with. Lectures are also given to the sheep-shearing experts attending the department of sheep and wool training classes. Those are trained so as to be useful general handy men about a sheep station, and the instruction given in these lectures chiefly bears on water supply, rainfall, tank storage, pumps, and the working of lighting plants, such as acetylene and petrol gas generators, &c. In the practical workshops day classes are held two afternoons per week in general plumbing and tinsmith work; and a day class is also held for the sheep-shearing experts, who are instructed in simple soldering and sheet-iron work, such as would enable them to do simple repairs to guttering and downspouts, tanks, pumps, milk pails, &c.

SPECIAL PRIZES.

The following special prizes are annually available to the students in the Department of Sanitation:—

Metropolitan Water Supply and Sewerage Board Gold Medals, value £5 each:—

The Sanitary Engineering Medal for the best Honours pass in the final year of the Sanitary Engineering Course (principal subjects),

The Plumbing Medal for the best Honours pass in the fourth year or the advanced course of Practical, General, and Sanitary Plumbing.

The Master Plumbers' Association Medal for the best third year's Honours pass in Practical, General, and Sanitary Plumbing. Value, £2.

Messrs. John Danks and Sons' prize for the best Honours pass in second year's Practical, General, and Sanitary Plumbing.

Mr. A. W. Robey's prize for best first year's Honours pass in Practical, General, and Sanitary Plumbing.

Messrs. John Danks and Sons' prize for the best Honours pass in first year's Practical Plumbing.

Mr. J. L. Bruce's prize for the best Honours pass in the first year's Theory of Plumbing.

PROGRAMME OF CLASSES.

DEPARTMENT OF SANITATION.

JOHN L. BRUCE, Mem. Royal San. Inst., Lecturer in charge of Department.

SANITARY ENGINEERING—Lectures and Laboratory.

Course A—Lighting, Heating, Cooling, Ventilation, Wednesday, 7.30 to 9 p.m.

Course B—Water Services, Drainage, and Domestic Sanitation, Tuesday, 7.30 to 9 p.m.

Course C—Public Water Supply and Sewerage, Municipal Sanitation, Tuesday, 6 to 7.30 p.m.

Practical Testing Class, Thursday, 7 to 9 p.m.

SPECIAL COURSE FOR SANITARY INSPECTORS—

Course D—Monday, 7.30 to 9 p.m.

SANITARY LAW, INFECTIOUS DISEASES, &c. (2nd and 3rd Terms)—T. W. Sinclair, M.D., D.P.H., Wednesday, 6.45 to 7.45 p.m. Fee, 8s. per term.

INSPECTION OF MEAT AND ANIMALS (2nd and 3rd Terms)—J. D. Stewart, M.R.C.V.S.—Wednesday, 7.45 p.m. to 9 p.m. Fee for course, 21s. Visits to Abattoirs, as arranged.

PLUMBING—Chief Teacher, Wm. Nelson—Assistant Chief Teacher, H. S. Gray; Assistant Teachers, W. S. Lawson, H. Malcolm, T. H. Nicholls, and W. E. Patino; Junior Assistant, D. Auld.

1st and 2nd years—Tuesday, Wednesday, and Friday, 7 to 9 p.m.

3rd and 4th years and advanced—Monday and Thursday, 7 to 9 p.m.

Day Classes—Plumbing—Wm. Nelson, Monday and Friday, 3 p.m. to 5 p.m.

SHEET-METAL WORKING—Friday, 3 to 5 p.m.

Lectures on Principles and Design—Friday, 7.30 to 9 p.m.,

J. L. Bruce, 3rd and 4th years, monthly.

Wm. Nelson, 1st and 2nd years, monthly.

Dates are posted in workshop.

NOTE.—The entry for two or more lessons per week for Plumbing entitles the Students to attend the lectures in Theoretical Plumbing.

Department of Training in Sheep and Wool.

(By ALFRED HAWKESWORTH, Lecturer in Charge of Department.)

OF all the industries followed in New South Wales, and even in the Commonwealth, at the present time, that of the pastoralist takes the undoubted premier position, and has for the last hundred years been the mainstay or backbone of the success of the country. Even in this great industry—although the main factor in placing this extensive island continent prominently before the older countries—it is surprising how little was known of that useful little animal, the sheep, and its covering, even up to twenty years ago. At the present day, although there are much greater facilities now offering for obtaining instruction how to breed, judge, and improve the fleece of the sheep, it is much to be regretted to note how lukewarm and even neglectful are many who follow this industry.

The first movement in these States was made eighteen years ago at the instigation of Mr. (now Sir) J. H. Carruthers, at that time Minister for Education, who in instituting classes at that time placed the formation of the Sheep and Wool Department in the hands of the present Lecturer-in-charge.

The head of this branch of technical education began his wool education with five years apprenticeship in the great worsted metropolis of England, viz., Bradford, Yorkshire. The experience gained, after eight years' work there, was afterwards supplemented by lengthy visits to other wool-growing countries, such as North America (three years), South Africa, and New Zealand.

The successful career of this department in this State has been so pronounced that similar institutions have been established within the last few years in other States, viz., South Australia, Queensland, and, quite recently, the Government of Victoria has applied to be furnished with details of the working of this, the original sheep and wool department of the Commonwealth.

The great popularity of this class in this State, amongst young men, especially the more ambitious sons of station-owners, managers, selectors, and farmers, no doubt was one cause of its success. To this may also be added the liberal course of practical instruction offered. It is also pleasing to add that very many students from all the neighbouring States and several other Colonies have taken advantage of this beneficial course of instruction.

The instruction given is practical, consisting of sheep-classing and judging, which is mainly carried on at Flemington on Thursday mornings, and at the College by the aid of illustrated lantern lectures, and visits to shows. This branch is greatly encouraged by the Executive of the New South Wales Sheep-breeders Association. At the annual show they provide a students' sheep-judging competition, where certificates and prizes are awarded,



STAFF OF THE DEPARTMENT OF TRAINING IN SHEEP AND WOOL.

Mr. Hawkesworth, Lecturer-in-charge, in centre, surrounded by Messrs. Hannaford, Stratford, and Cowley, Assistant Teachers.

according to merit. Practical instruction is given daily in wool, from the most elementary to the more advanced stages, including wool-classing for the pastoralist, and wool-sorting for the manufacturer and scourer. Consideration is also given weekly to types of wool, clean scoured yields, and spinning qualities; these latter branches are in the interests of students qualifying as woolbuyers.

Carbonizing and scouring tests also receive attention.

The work-rooms are spacious, with good light, and well supplied with the necessary wool-tables. At the entrance end of the room is the wool-classing space, wool-press, and all necessary details for preparing wool (bales) to be sent to the market. On the walls are to be found framed pictures of high-class Merino and British breeds of sheep; a large case for district types of wool; diagrams of sheep for showing points; models of sheeps' mouths.



STUDENTS' SHEEP-JUDGING COMPETITION AT THE ROYAL AGRICULTURAL SHOW.

indicating ages; cases containing samples of tops and combed wool, varying in quality from 24's (low Lincoln) to 80's (fine Merino). Plates showing the physical structure of wool, coloured engravings of all grades of Merino, engravings of various kinds of machinery used in the manufacture of fabrics made out of wool, are also displayed. A Machine-shearing Expert Class is in its second year, and promises to be a success. The object is to train young men to become thoroughly qualified to run engines, fix sheep-shearing machines, and keep them in thorough running order, and to effect general repairs.

In the lower room is a scouring plant, which is used for the purpose of determining the correct yields.

NIGHT CLASSES.—A night class is held on Mondays and Fridays, and has been in existence for considerably over twenty years, and it is surprising how the rolls continue to show such a high percentage of attendance. Even during the last three years the number of students far surpassed those of previous years. The object of this class is to offer suitable instruction i



THE WOOL-CLASSING ROOM—STUDENTS AT WORK.

various branches of the wool trade to those industrious young men who are not in a position to attend the day class, and who are ambitious to gain positions offered yearly by many of the wool firms. Also, many who intend going on the land are to be found amongst the students, with the view of learning something about both sheep and wool, to better prepare them for subsequent work on the land. Generally speaking, the greatest number of students are those who hold positions in different capacities in the offices of the various wool firms, and who, being possessed of industrious tendencies, hope that some wool knowledge will be of great assistance to them. So it has been, in many cases, both amongst the selling and buying wool firms. During the last few years a good many wool-samplers, employed by the various firms, are to be found in the long lists of students, and the instruction gained has been of such a useful character that many are now holding good positions. Wool-scouring works have also provided many willing students, who have bettered their positions considerably, and have been helped to rise above the ordinary rank. This night class also acts as a recruiting ground for the day class. Practical instruction is given in wool in all its various branches, from the opening of fleeces to preparing them for the market. Facilities are also offered to the students to become thoroughly acquainted with clean yields of wool, through the work of the day class where the wool is scoured, and actual results are given. Types of wool and their manufacturing qualifications are frequently brought before the students. The latter are most essential parts of the wool trade, especially to those engaged by the Sydney wool firms.

To further assist to impart information, lantern lectures are given on the last Friday night in each month, when sheep receive as much attention as wool, to the benefit of all students, whether they are intended for the land or the town.

THE SCIENTIFIC EXAMINATION OF WOOL.—In connection with the Department a course of instruction in the technical and histological relations of wool is also given by S. J. Johnston, B.A., B.Sc. (Syd.). This course embraces the following work :—Use of microscopes ; examination

of simple objects; action of reagents. Appearance and structure of silk, cotton, ramee, sisal, flax, &c.; action of reagents. Structure and appearance of hairs of sheep, llama, alpaca, vicuna, cashmere, goat, camel, rabbit; action of reagents. Microscopic measurements of wool and other fibres; classification into fine, medium, and strong. Structure and development of the epidermis. Origin and development, growth, and nutrition of hair and hair follicle of various animals. Effects of dyeing, dipping compounds, scouring, carbonization, climate, food, &c., storing, variation of fibres and the factors contributing to it.



THE SCIENTIFIC EXAMINATION OF WOOL—STUDENTS AT WORK.

The following ex-students have been successful in the sheep and wool industry:—

Messrs. W. and J. Hayes, of Messrs. Hayes Bros., Wool-scourers, Goodooga, Brewarrina, and Walgett; Messrs. Suttors, two brothers who went through the classes and are now wool-scourers at Walgett; Mr. Lyle Johnson, Wool Instructor, Brisbane Technical College; Mr. G. H. Gerber, Wool Broker, Sydney; Mr. R. Hyndes, Wool Broker and Scourer, Sydney; Mr. Young, of Messrs. Schute, Bell, & Co.; Mr. P. Begg, of Messrs. Begg and Son, Wool Brokers, Sydney; Mr. R. H. Maund, Manager for Laverstock, Bowning; Mr. Seton, Melbourne representative for G. H. Gerber, Wool Broker, Sydney; Messrs. Linklater and Bannister, Wool Brokers and Scourers, Sydney; Messrs. Hannaford, Stratford, and Cowley, who are at present teachers in the Sheep and Wool Class; Mr. Witfield King, Wool Valuator, with Messrs. Winchcombe, Carson, & Co.; and Mr. Dawson, Auctioneer, Winchcombe, Carson, & Co.

PROGRAMME OF CLASSES.

DEPARTMENT OF TRAINING IN SHEEP AND WOOL.

ALFRED HAWKESWORTH, Lecturer in Charge of Department.

DAY CLASSES (Sheep and Wool, Wool Classing, &c.), 9.30 a.m. to 4.30 p.m. (Term—From 1st February to 31st July—Fees, £5 5s.)

WOOL CLASSING—Monday and Friday, 7 to 9 p.m.

Department of Women's Handicrafts.

(By MISS M. E. ROBERTS, Teacher of Dressmaking.)

In this Department women may learn to make all the clothes they wear, excepting boots and gloves.

The separate classes which form this Department are:—Dressmaking, Ladies' Tailoring, Millinery, Plain Sewing, Corset-making, Art Needlework, Lace-making, Flower-making.

DRESSMAKING.—In the Dressmaking Class students are taught every branch of their art, commencing with the cutting. No student is allowed to make a dress until she can cut it out to measures so as to produce a perfect fit. Every student learns the cutting, and makes at least one dress during the first term. As students work on their own material, the garments they make become their own property; so that, even in the first term, the student saves the price of her fees in getting a dress made. During the second and subsequent terms students find there is a great portion of the work which they are now able to do without help, and this is done at home. Consequently they manage to make a great many more dresses. This is not encouraged primarily to get a quantity of garments made, though this makes the classes more profitable to the student, but chiefly because it gives the student varied experiences.

Dresses vary so much, not only in the style and cut, but in the texture of the material, that the making of one dress, or even some dresses, does not show how all materials or all styles are to be treated. Hence students are helped to make garments for different figures, in varied styles, and of all kinds of material. That this kind of experience is the best a girl can have is proven by the number of women who go from this College into responsible positions, with no other training than they get here.

Dresses, wrappers, robes, cloaks, capes, &c., are made for children as well as adults.

LADIES' TAILORING.—When a student has learned to make a dress she may be taught to cut, design, and make ladies' coats and skirts. A great many students learn this branch of their art and become expert. Miss Forster of this College gained the First Prize at the Australian Exhibition of Women's Work, in Melbourne in 1907, for the best-made coat and skirt.

MILLINERY.—Those who join the Millinery Class learn how to make and trim every kind of head-gear for women and children. They first begin with shape-making in wire. From this they go on to covering them with straw, and then proceed until they are thoroughly conversant with every kind of material used in millinery and how it is worked. As students



STAFF OF THE DEPARTMENT OF WOMEN'S HANDICRAFTS.

From left to right—

Sitting: Miss Maxwell, Assistant, Dressmaking; Miss Roberts, Teacher in charge of Department; Miss McArthur, Lace-making.

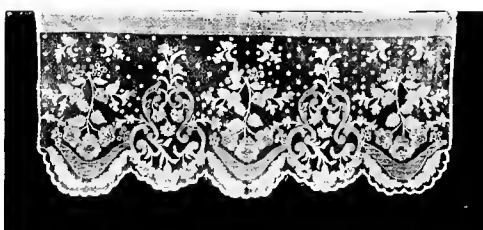
Standing: Miss Dove, Assistant Teacher, Dressmaking; Miss Lucy Roberts, Millinery.

bring their own materials in all these departments, the things made become their own property. Some students make as many as fifty hats during the year.



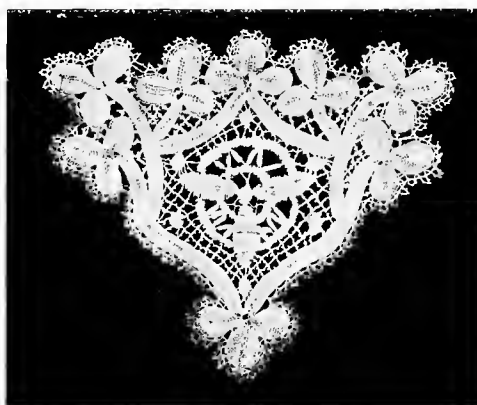
DRESSMAKING CLASS-ROOMS.

Students at Work.



EXAMPLE OF LACE MADE BY STUDENTS.

LACE-MAKING.—This is a new departure, and promises to be a most popular class. Students are taught all kinds of bobbin, lace, and needle point. One and all who take up this work find it most fascinating. Some very good Torchon, fine specimens of Venetian point and Maltese lace have been made, as well as Limerick and other kinds. The accompanying pictures are photos of some fine Limerick and Venetian lace, made by one of Miss McArthur's pupils.



EXAMPLE OF LACE MADE BY STUDENTS.

PLAIN SEWING AND CORSET-MAKING.—Students in this class are not only taught the stitches which it is necessary to make with the needle, but learn to cut out and make up the daintiest lingerie both by machine and hand. Miss Badger gained the First Prize for the best handmade single article of underclothing at the Australian Women's Work Exhibition in 1907; the underskirt exhibited was made in this class. So also was the slip bodice, for which Miss Bevan was awarded the First Prize for the best handmade slip.

There are three large, bright, airy class-rooms with suitable, large tables for cutting out. Sewing machines, pressing apparatus, kilters, &c., are all provided in the class-rooms. The latest designs from Paris and Vienna are in the rooms for students to use as copies.



EXHIBITION OF STUDENTS' WORK.
Dressmaking, Millinery, and Art Needlework (year 1901).

The millinery room is provided with small portable tables; two students sitting at each table, which adds to the comfort of the worker.

A dressing-room is provided where students remove their cloaks, hats, &c.; and there is a comfortable fitting-room, where students bring their friends to fit in privacy.

When students have finished their course they are not lost sight of. An Association exists which brings ex-students of all classes in the Department of Women's Handicrafts together periodically, where they discuss ways and means, quick and new methods, and the latest ideas of arriving at the accomplishment of their object—to make a woman's garments as beautiful, suitable, and economic as possible.

The following is a list of some of the students who have gained positions through instruction given in this Department:—

Miss Forster, Head Teacher, Dressmaking Department, Adelaide; Miss Cooper, Head Teacher, Dressmaking, Rockhampton; Miss E. Smith, Head Teacher, Dressmaking, Burwood Ladies' College; Miss G. Blake, Head Teacher, Dressmaking, Young Women's Christian Association; Miss Gascoygne, Head Teacher, Dressmaking, Railway Institute; Mrs. Sanders, Head Teacher, Dressmaking, Mount Gambier, South Australia; Miss Jones, Head Teacher, Manuka, New Zealand; Miss Fallover, Cutter, Cromer & Co., Sydney; Miss Forwood, Cutter, A. & A. Hordern, Sydney; Miss Armstrong, Milliner, Ravenscroft & Co., North Sydney; Miss Rose,



MILLINERY AND LACE-MAKING CLASS-ROOM.

Students at Work.

Milliner, Winn & Co., Sydney; Miss Dove, Teacher, Dressmaking, Sydney; Miss Maxwell, Teacher, Dressmaking, Sydney; Miss Barnes, Teacher, Dressmaking, Milton; Miss Cox, Teacher, Dressmaker, Goulburn; Miss Fortescue, Teacher, Dressmaking, Hay and district; Miss Peril, Teacher, Dressmaking, Tamworth; Miss Melville, Teacher, Dressmaking, Kempsey; Miss Henderson, Teacher, Dressmaking, Bega; Miss McPhie, Teacher, Dressmaking, Grafton; Miss Dalton, Teacher, Dressmaker, Taree; Miss Smallwood, Teacher, Dressmaker, South Coast; Miss Rootes, Teacher, Dressmaking, Parkes; Miss Richmond, Teacher, Dressmaking, Moruya; Miss Wilson, Teacher, Dressmaking, Kogarah; Miss Roach, Teacher, Dressmaking, Albury; Miss Clapham, Teacher, Dressmaking, Bathurst; Miss King, Teacher, Dressmaking, Penrith; Miss Bradley, Teacher, Dressmaking, Waverley; Miss Fortescue, Teacher, Millinery, Goulburn; Miss Marsden, Teacher, Millinery, Kempsey.

PROGRAMME OF CLASSES.

DEPARTMENT OF WOMEN'S HANDICRAFTS.

DRESSMAKING—Miss M. E. Roberts, Teacher. Drafting, Cutting, Fitting, and Making—Monday, Tuesday, Wednesday, Thursday, and Friday, 10 a.m. to 1 p.m.; Monday, Tuesday, Wednesday, and Friday, 1.30 to 4.30 p.m.; Monday, 7 to 9 p.m. Fees, 15s. per term for one Lesson a week; 25s. per term for two Lessons a week.

MILLINERY—Wednesday and Friday, 1.30 to 4.30 p.m., and Monday, 7 to 9 p.m. Fees, 15s. per term for one Lesson a week; 25s. per term for two Lessons a week. Special arrangements made for daily pupils.

DRESSMAKING—Demonstration Class—Monday, 2 to 3 p.m. Fees, 8s. per term.

DRESSMAKING—Teachers' Course. Fees, £1 per year.

LACE-MAKING—Miss M. McArthur—Tuesday, 10 a.m.; Thursday, 2 p.m. Fees, 15s. per term of one Lesson a week; 25s. per term for two Lessons per week.

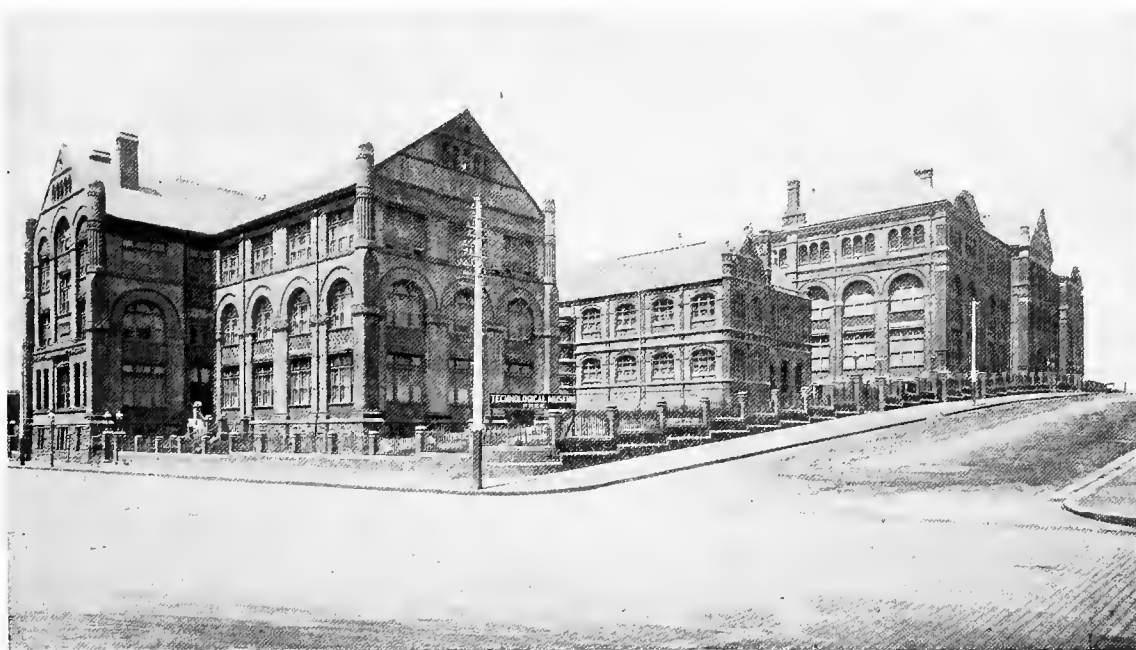
Sydney Technological Museum.

Curator and Economic Botanist, R. T. BAKER, F.L.S., Corr. Mem. Phar. Soc., Great Britain.

Assistant Curator and Economic Chemist, H. G. SMITH, F.C.S.

HISTORY OF THE MUSEUM.

THE Museum was originally established in the Garden Palace, but after the fire occupied temporary premises at the Agricultural Hall, Outer Domain. It is now situated in Harris-



GENERAL VIEW OF MUSEUM AND TECHNICAL COLLEGE BUILDINGS.

street, Ultimo, within five minutes walk of Central Railway Station. For some years, Mr. J. H. Maiden, F.L.S., was Curator. It contains considerably over 150,000 specimens, is a bureau of information in regard to the raw products and manufactures of New South Wales, and visitors are advised as to probable sources of information provided requirements cannot be satisfied at the Museum. The new Museum was opened on 4th August, 1893, by His Excellency the Governor, Sir Robert Duff, G.C.M.G. The building rises to a height of 75 feet and is 183 feet long by 50 feet wide. The style adopted is an attempt to adapt the spirit of Romanesque to the necessities and materials of the present day. There are three main floors 15 feet high, divided transversely into bays 16 feet wide, which, while providing separate compartments to facilitate the classification of the exhibits into groups, and simplifying the study by visitors of the different kinds of specimens, afford an amount of wall space (on the cross-partitions), for the exhibition of diagrams, &c. The amount of floor space on each floor is 9,000 square feet, and of wall space 17,000 feet, making in all 26,000 square feet respectively.

THE OBJECTS OF THE MUSEUM.

1. To assist in every way the development of the natural resources of the State in particular, and the Commonwealth in general, by bringing together for comparison, instruction, &c., collections of our raw products, such as wool, timber, minerals, essential oils, &c.

2. To scientifically investigate these products and so ascertain the various economic purposes to which they can be put or for which they are suitable.

3. To publish these results for the benefit of the commercial world.

4. To furnish correspondents and visitors with information on their own and Museum specimens.

5. To collect and exhibit the various economic products of the world, and to gather, as far as possible, all information relating to them.

6. The specimens are available to illustrate the lectures in the local Technical Colleges, and nature study in the Public Schools.

In the endeavour to fulfil the objects of the Museum as enumerated above, a very large amount of original research has been undertaken on the Economics of the State of New South



ESSENTIAL OILS COURT

Wales in particular, and on those of Australia in general, and over 200 original papers and books bearing on these subjects have been published by the Scientific Staff since its inception. Some of these works have received the highest commendation from the scientific world, particularly



M. F. Connelly, Photo.

Nat. Size.

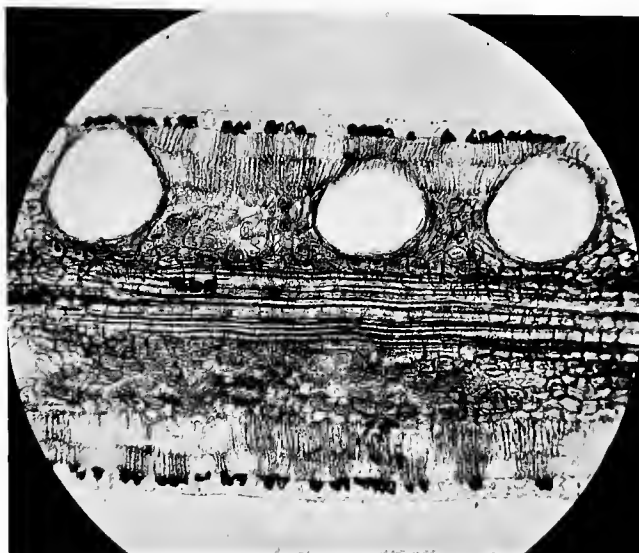
LEAF OF EUCALYPTUS SMITHII, (R. T. BAKER).

The venation indicates that the oil contains Eucalyptol together with pinene, and that phellandrene is absent.

Only Eucalyptus Oils obtained from species having this venation will meet the requirements of the Pharmacopœia.

the Research on the Eucalypts by Messrs. Baker and Smith, published in 1902. This book contains the botanical and chemical investigation of nearly the whole of the species of *Eucalyptus* growing in New South Wales and Eastern Australia. The work succeeded in concentrating the knowledge concerning this wonderful group of trees, and brought to light several economics previously unknown, as well as scientific peculiarities of considerable importance. As, for instance, the discovery of the relation between the venation of the leaf and the oil constituents has now become of practical economic value (see plate of leaf).

An even more extensive work has just been completed by Messrs. Baker and Smith, bearing on the economics of the Australian Pines, a work which has been in progress during the last ten years. The publication of the results of this investigation will add considerably to the knowledge of these indigenous trees, and suggest new avenues of economic production. Many



TEA TREE.

Melaleuca uncinata, Sm.

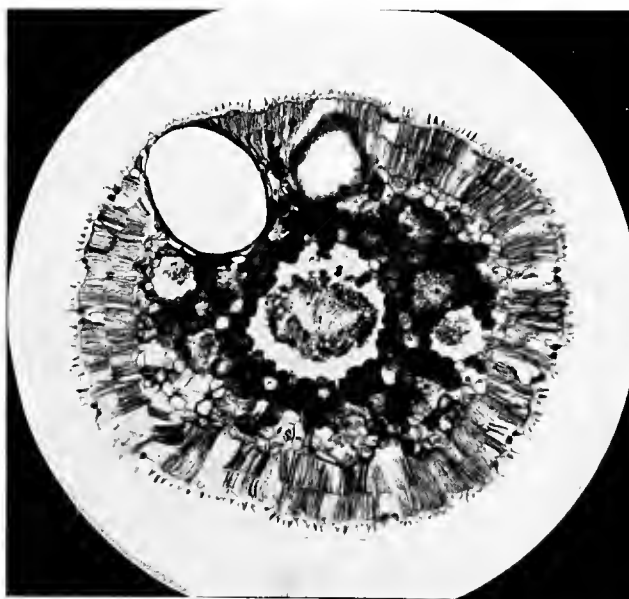
Longitudinal section showing portion of acicular leaf. The three circular spaces are empty oil glands

[From one of the Papers on Melaleucas.]

other discoveries have been made with Australian groups of trees, such as the *Melaleucas*, yielding, in one species, a new Cajuput; *Leptospermum*, giving a new citral-yielding oil; *Darwinias* from which the valuable alcohol Geraniol may be obtained; as well as the *Cinnamomums*, and many other important genera now being investigated.

In the Economic Botanical Section the investigation of New Timbers for special work has recently brought to light several species which for carriage construction are specially useful, and fulfil the requirements of the carriage-builder admirably. These specimens are displayed on the first floor.

In the Economic Geology Section a most extensive collection of Marbles and Building Stones have been got together, and are displayed on the ground floor. From the study of this



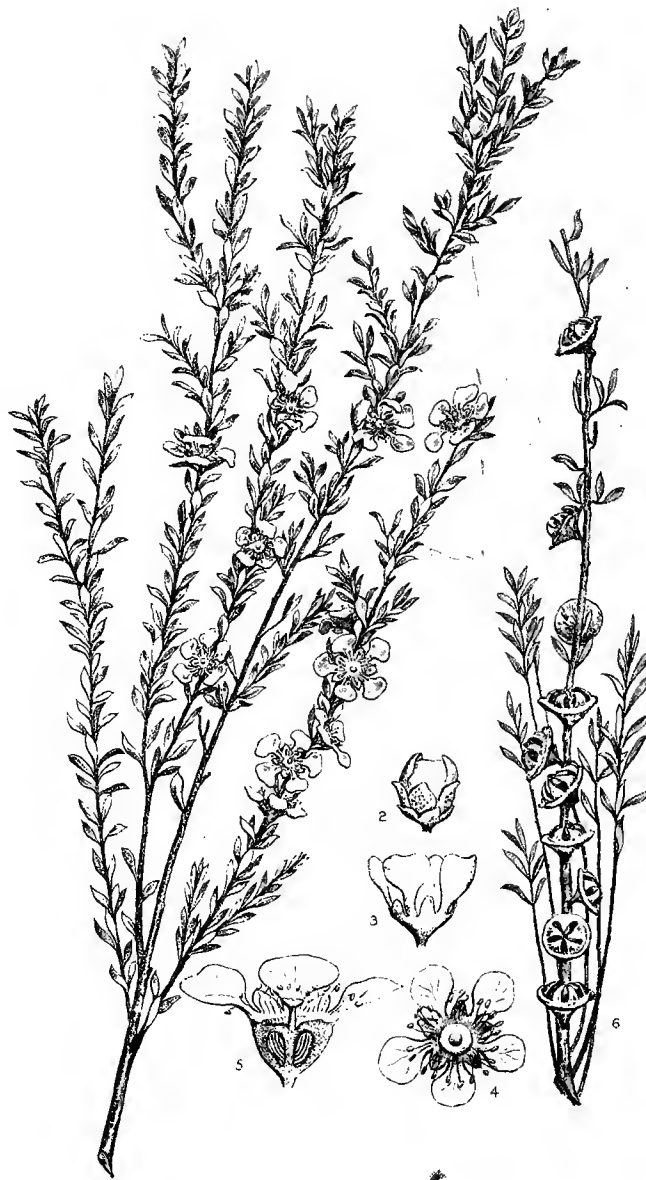
TEA TREE.

Melaleuca uncinata, Sm.

Transverse section of acicular leaf, showing one oil gland,

[From one of the Papers on Melaleucas.]

collection it will be seen that New South Wales is exceedingly rich in material of this character and a book has been published by the Curator illustrating, by the three-colour process, the beauty



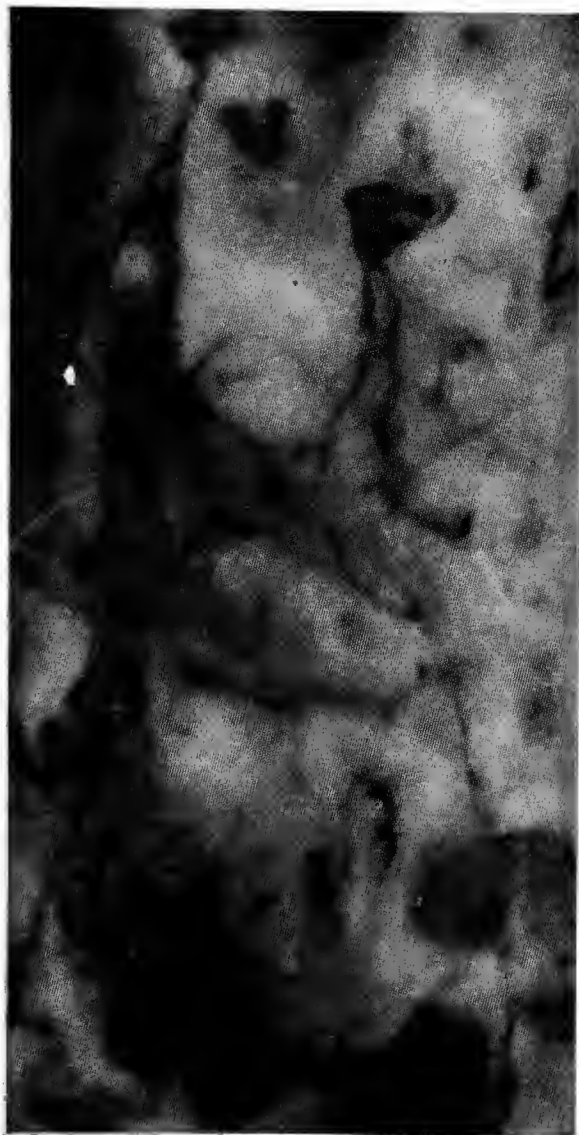
R. T. Baker, del. ad Nat.

LEMON-SCENTED TEA-TREE.

(*Leptospermum Liversidgei*, R.T.B. et H.G.S.)

[A myrtaceous plant, yielding citral.]

of the marbles and granites of this State. That the photographs are faithful representations of the characters of these polished marbles can be seen from the accompanying reproductions taken from the book above mentioned. The get-up of this publication has been much admired.



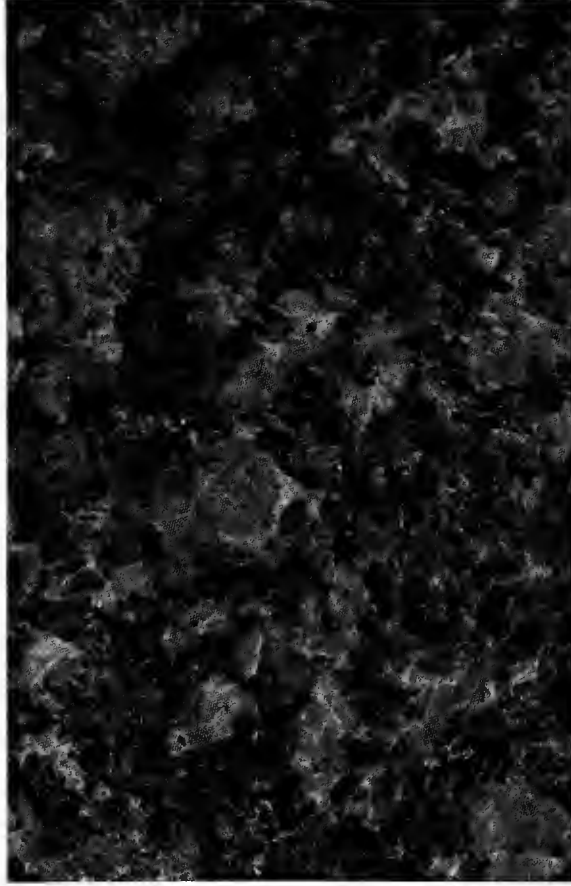
BORENORE MARBLE (BLUE).

Nat. Size.



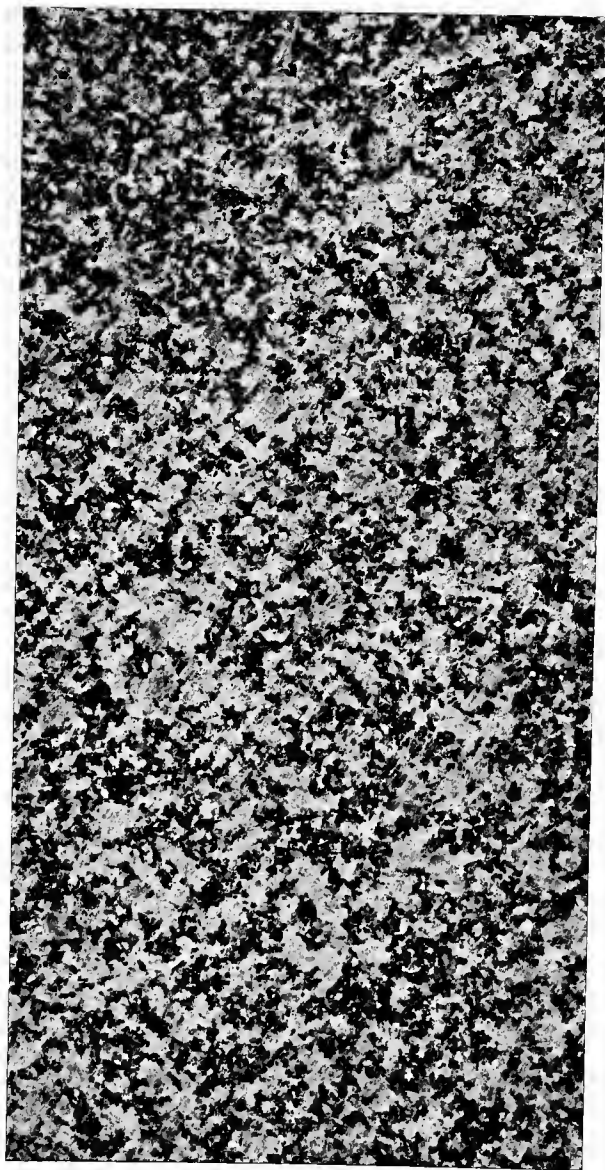
LIME KILNS MARBLE BATHURST.

Half Nat. Size.



Ref. Size

MUDGE GRANITE.



URALLA GRANITE.

Nat. Size.

RESEARCH WORK.

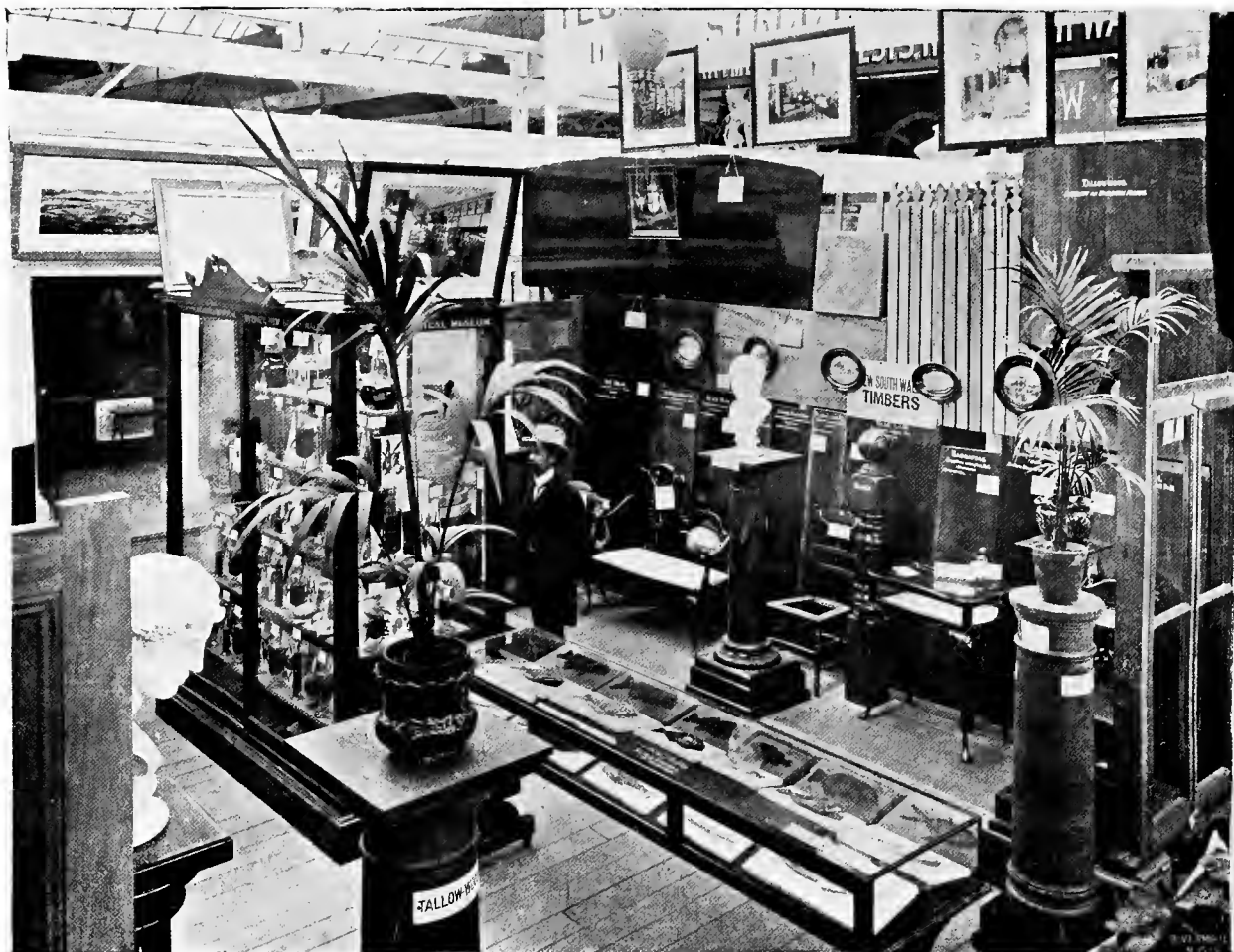
As showing the line of Economic and Scientific Research carried out by the Technological Museum, the following are the titles of some of the original works published during the last ten years:—

- ON A NEW GENUS OF THE NATURAL ORDER MYRTACEÆ. *Proc. Linn. Soc. N.S.W.*, Vol. XIII, 2nd series. Nov. 1898.
- ON MYRTICOLORIN, THE YELLOW DYE MATERIAL OF EUCALYPTUS LEAVES. *Trans. Chem. Soc.* 1898.
- ON TWO NEW SPECIES OF CASUARINA. *Proc. Linn. Soc. N.S.W.*, Vol. XIV, 2nd series. Oct. 1899.
- ON A NEW APOCYNACEOUS PLANT YIELDING LARGE EDIBLE TUBERS. *Proc. Linn. Soc. N.S.W.*, Vol. XIV, 2nd series. July, 1899.
- ON THE DARWINIAS OF PORT JACKSON AND THEIR ESSENTIAL OILS. *Proc. Roy. Soc. N.S.W.* November, 1899.
- ON A EUCALYPTUS OIL CONTAINING 60 PER CENT. OF GERANYL-ACETATE. *Proc. Roy. Soc. N.S.W.* November, 1900.
- ON A NEW AROMATIC ALDEHYDE OCCURRING IN EUCALYPTUS OILS. *Proc. Roy. Soc. N.S.W.* December, 1900.

(Continued over.)



TECHNOLOGICAL MUSEUM EXHIBITS, NEW ZEALAND INTERNATIONAL EXHIBITION, 1906.



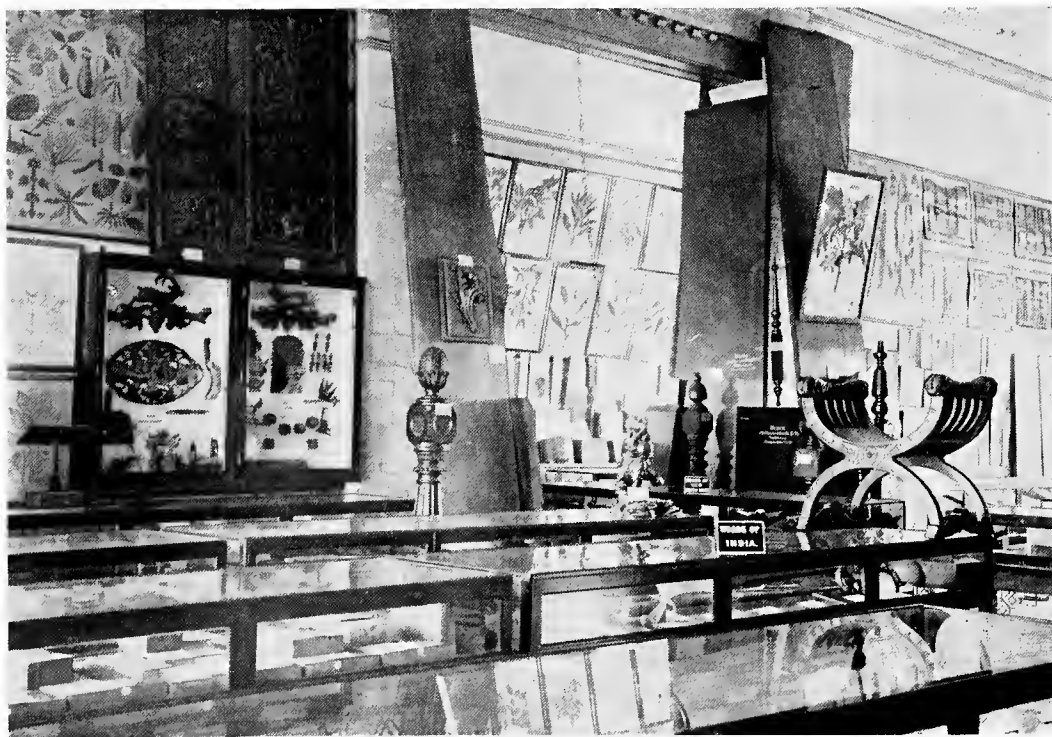
TECHNOLOGICAL MUSEUM EXHIBITS, NEW ZEALAND INTERNATIONAL EXHIBITION, 1906.

- ON A NEW SPECIES OF ANGOPHORA. *Proc. Linn. Soc. N.S.W.* April, 1900.
- ON OUR FORESTS AND THEIR COMMERCIAL POSSIBILITIES. *Read before the Timber and Forestry Laws Conference held in Sydney, October, 1900.*
- ON THE RELATION BETWEEN LEAF VENATION, AND THE PRESENCE OF CERTAIN CHEMICAL CONSTITUENTS IN THE OILS OF THE EUCALYPTS. *Proc. Roy. Soc. N.S.W.* October, 1901.
- ON A NEW SPECIES OF DISTOMUM, FROM THE PLATYPUS. *Proc. Linn. Soc. N.S.W.* July, 1901.
- A RESEARCH ON THE EUCALYPTS, ESPECIALLY IN REGARD TO THEIR ESSENTIAL OILS.. *Royl. 4to (12 x 10, 300 pp. 46 plts).* 1902.
- ON A NEW SPECIES OF DISTOMUM FROM SAWFISH SHARK. *Proc. Linn. Soc. N.S.W.* July, 1902.
- ON A NEW SPECIES OF SYMPLOCOS FROM N.S.W. *Proc. Linn. Soc. N.S.W.* November, 1902.
- ALUMINIUM THE CHIEF INORGANIC ELEMENT IN A PROTEACEOUS TREE, AND THE OCCURRENCE OF ALUMINIUM SUCCINATE IN TREES OF THIS SPECIES. (One Plate.) *Proc. Roy. Soc. N.S.W.* July, 1903.

(Continued over.)

- ON A NEW SPECIES OF CALLITRIS FROM N.S.W. *Proc. Linn. Soc. N.S.W.* November, 1903.
- ON EUCALYPTUS KINOS, THEIR VALUE FOR TINCTURES, AND THE NON-GELATINIZATION OF THE PRODUCT OF CERTAIN SPECIES. *Proc. Roy. Soc., N.S.W.* August, 1904.
- ON THE ABSENCE OF GUM AND THE PRESENCE OF A NEW DIGLUCOSIDE IN THE KINOS OF THE EUCALYPTS. *Proc. Roy. Soc. N.S.W.* June, 1904.
- ON SOME SPECIES OF HOLOSTOMIDÆ FROM AUSTRALIAN BIRDS. *Proc. Linn. Soc., N.S.W.* April, 1904.
- A NEW ACTINOTUS FROM EASTERN AUSTRALIA. *Proc. Linn. Soc. N.S.W.* June, 1905.
- THE REFRACTIVE INDICES, WITH OTHER DATA, OF THE OILS OF 118 SPECIES OF EUCALYPTUS. *Proc. Roy. Soc. N.S.W.* August, 1905.
- AN INVESTIGATION ON THE BARKS OF FOUR WEST AUSTRALIAN SPECIES OF EUCALYPTUS. *Journ. of Agriculture, West Australia,* April, 1905.
- ON THE OCCURRENCE OF CALCIUM OXALATE IN THE BARKS OF THE EUCALYPTS. *Proc. Roy. Soc. N.S.W.* May, 1905.
- SOME WEST AUSTRALIAN EUCALYPTS AND THEIR ESSENTIAL OILS. *Pharm. Journ., London.* September, 1905.
- ON AN UNDESCRIBED SPECIES OF LEPTOSPERMUM AND ITS ESSENTIAL OIL. *Proc. Roy. Soc. N.S.W.* December, 1905.
- AN UNDESCRIBED CRYPTOCARYA FROM EASTERN AUSTRALIA. *Proc. Linn. Soc. N.S.W.,* December, 1905.
- EUCALYPTUS STAIGERIANA THE "LEMON-SCENTED IRONBARK" AND ITS ESSENTIAL OIL. *Pharm. Journ., London.* March, 1906.
- THE AUSTRALIAN MELALEUCAS AND THEIR ESSENTIAL OILS. Part I. *Proc. Roy. Soc. N.S.W.* August, 1906.

(Continued over.)



TIMBER COURTS.

VITIS OPACA AND A CHEMICAL INVESTIGATION OF ITS ENLARGED ROOTSTOCK (TUBEL).
Two Plates. *Proc. Roy. Soc. N.S.W.* August, 1906.

CONTRIBUTION TO A KNOWLEDGE OF THE AUSTRALIAN FLORA. Part V. *Proc. Linn. Soc. N.S.W.* November, 1906.

PROBABLE USES OF EUCALYPTUS OIL CONSTITUENTS IN DENTISTRY. *Read at the Australasian Dental Congress, held in Sydney, 1907.*

ON THE VALIDITY OF SPECIFIC RANK OF CALLITRIS MORRISONI. *Read before the Roy. Soc. of Victoria.* November, 1907.

THE AUSTRALIAN MELALEUCAS AND THEIR ESSENTIAL OILS. Part II. *Proc. Roy. Soc. N.S.W.* 1907.

ON A NEW SPECIES OF ARDISIA FROM N.S.W. *Proc. Linn. Soc. N.S.W.*

THE AUSTRALIAN FLORA IN APPLIED ART. This is the title of a Presidential address given before the Australian Flora Society.

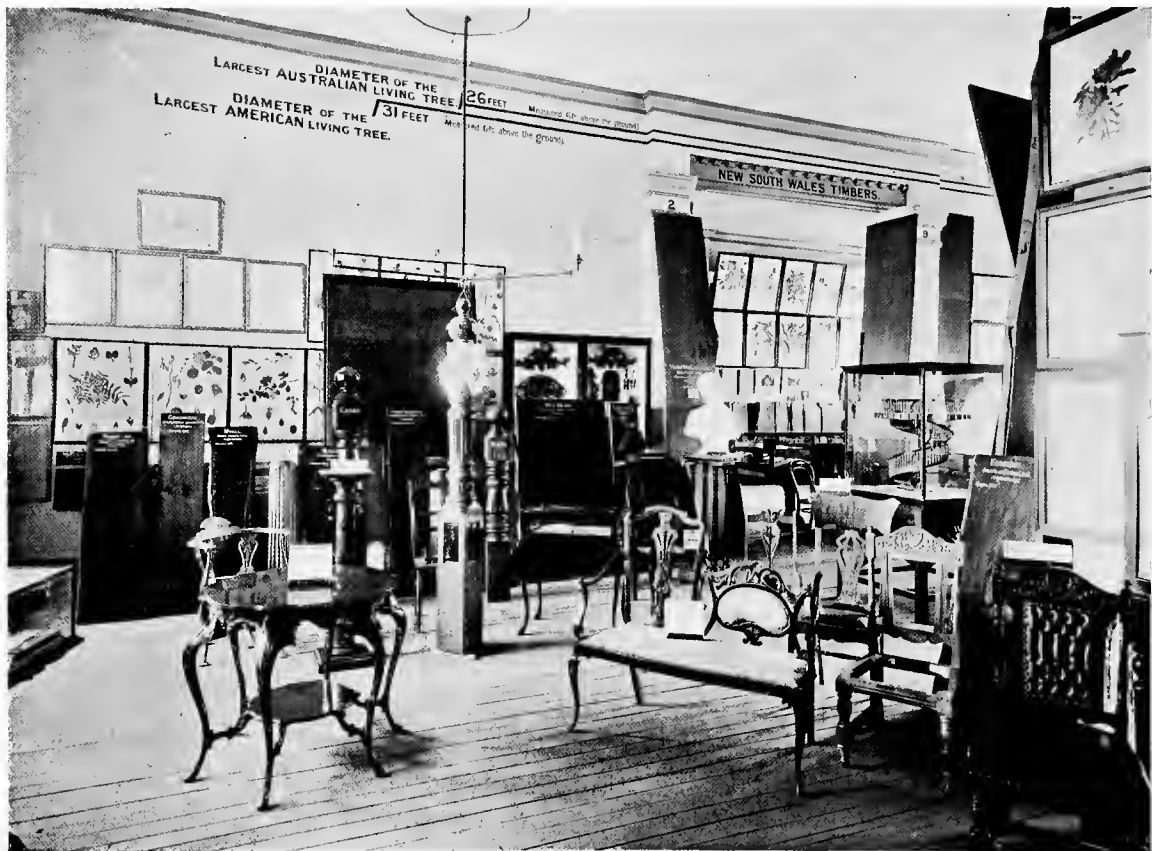
NEW SOUTH WALES TIMBERS SUITABLE FOR COACHBUILDING. *Read before the Australasian Coach and Carriage Builders' Association at the Sydney Congress, 1908.*

BUILDING AND ORNAMENTAL STONES OF NEW SOUTH WALES. (24 pp. 56 plates 24 in colour.) 1908.

THE SEDIMENTARY ROCKS OF THE LOWER SHOALHAVEN RIVER. *Proc. Roy. Soc. N.S.W.*, 1908.

INDIARUBBER FROM THE EUCALYPTS, *Proc. Roy. Soc., N.S.W.*, 1908.

PINES OF AUSTRALIA. Part I. 19 plates. *Proc. Roy. Soc., N.S.W.*, 1908.



TIMBER COURT.

[Furniture made from N.S.W. timbers.]

The Museum which has an entrance from the Technical College Grounds as well as by the main entrance in Harris-street is divided into three main floors, the ground floor being devoted to the display of specimens relating to the Mineral Kingdom, the first floor to those of the Botanical Kingdom, and those on the second floor to the Animal Kingdom.



POLISHED COLUMNS OF N.S.W. BUILDING-STONES.

SYNOPSIS OF EXHIBITS.**(A)—MINERAL KINGDOM**

The ground floor is devoted to economic geology, together with metallurgy, art metal-work, and casts in plaster of various objects of applied art. In the south end of this floor are placed the greater portion of the heavy iron and steel specimens, illustrating both in size and quality the material required for various works, and there will also be found the ores of iron and iron minerals. Models of furnaces used in the manufacture of iron and steel are also shown in this bay. In the next are various models of engineering work and machinery. In the bay opposite is a complete set of tested specimens of the principal materials used in building and machine construction. Here are also sets illustrating all the stages in the manufacture

**ART METAL-WORK COURT.**

of various steel goods. The next bay is devoted to art and metal work, grouped as far as possible, to represent the production of various countries. Bay 2 is devoted to fictiles, or reproductions in plaster of various art objects. The next bay is devoted to the display of sets illustrating the material and processes employed in the manufacture of glass and pottery. Passing east-

wards are two bays which are devoted principally to models and furnaces used in the manufacture of pottery and bricks. The next bay is devoted to porcelain where are exhibited in special cases, specimens of some of the world's famous ceramics,—Cauldon, Doulton, Royal Worcester, and Vienna being well represented. In several cases are displayed samples of old china, both English and Continental. In the field of ceramic industry little, or not much, has been attempted in the past as far as Australia is concerned, although historically it might be said to date back a long way, for it is now known that Sir Joseph Banks when here with Captain Cook collected a specimen of clay and submitted it to that prince of potters, Josiah



CERAMICS COURT.

Wedgwood, who made a medallion from it, and stamped upon it Virgil's words, "*Sic Fortis Etruria Crevit*," thus expressing a hope that Australia would grow strong in ceramics like Etruria. The deposits of kaolin distributed throughout the State have not yet been seriously worked; but when modern appliances and methods are brought to bear, and our clays are treated in a scientific way, such as obtains in Europe, there seems no reason why just as satisfactory results should not be obtained here. Bay 17 contains some beautiful specimens of New South Wales building and ornamental stones, the collection including numerous large columns of

polished marbles, mantelpieces and granites. Bay No. 16 is devoted to the exhibition of specimens illustrating phenomenal geology, &c., for teaching purposes. Bay No. 15 is devoted to rocks, consisting of specimens of sandstone, limestone, granite, diorite, dolerite, &c. The side of the ground floor nearest to the Technical College is devoted principally to mineralogy. Foreign marbles, granites, serpentines, &c., decorate the ground floor.



WOOL COURTS.

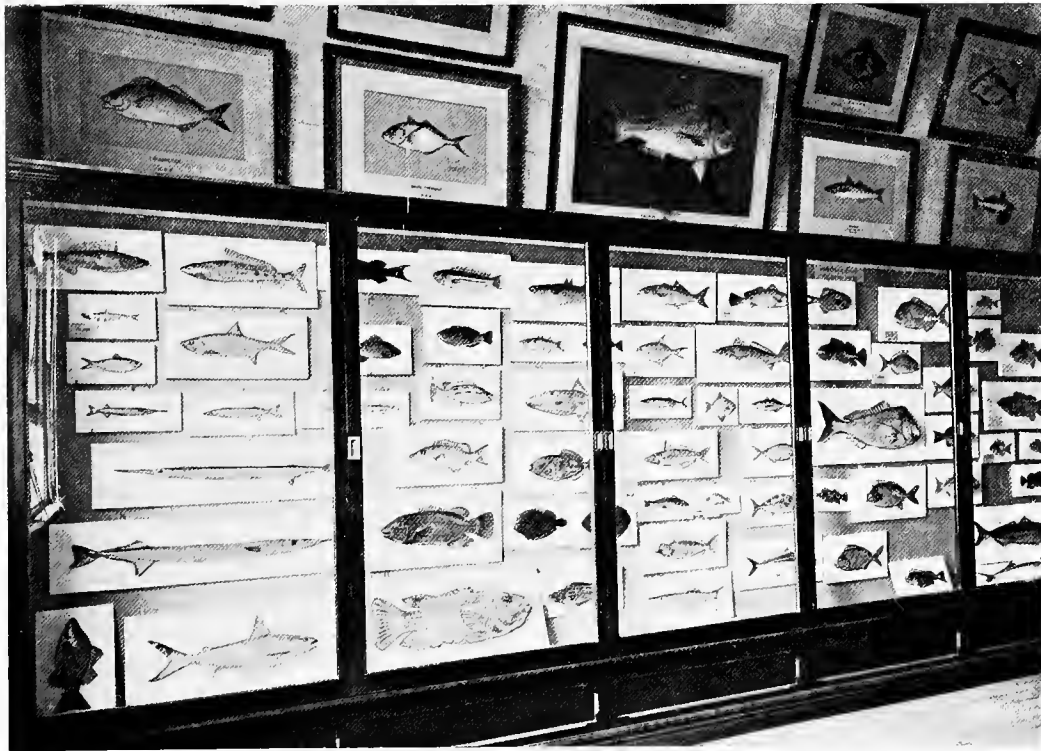
(B)—BOTANICAL KINGDOM.

On the first floor are grouped in their respective courts or bays the economic products of the vegetable kingdom, and also in juxtaposition, models, diagrams, and agricultural appliances. The number of bays is twenty-two, and eight of these contain timber specimens from all parts of the world, more especially from New South Wales. In bay 1 and 2 are displayed samples of locally made as well as foreign historical furniture. Bay 10 is set apart for illustrating the Australian Flora in applied arts. Fourteen cases in Bay 12 are crowded with specimens of hemp, jute, flax, sisal, ramie, esparto, and a multitude of other vegetable fibres. Wattle barks form the chief feature of bay 11. In bay 13 are models of wine-making apparatus used in the south of Europe, and other agricultural implements. Bay 14 contains cases of pulses, maize, wheat, and other cereals. Bay 15 contains starches, spices, and condiments, narcotic beverages, and Australian native foods. Bay 16 is devoted to seeds and fruits of Australian plants. Bay 17 contains cases of carpological specimens. Bay 18 contains perfumes, fixed and essential oils, and in the centre of the floor will be found cases in which are exhibited essential oils and camphors from material indigenous to Australia, which have been obtained by, and investigated in the Museum.

(C)—ANIMAL KINGDOM.

The wool section is one of the most important features of the Museum, and embraces an extensive collection of representative wools from almost every country. The collection arranged in 8 courts, contains 9,000 specimens of raw wool from the classic stud rams and ewes, flock sheep, and wools in all stages of manufacture.

Bay 9 on the second floor contains a collection of hides and furs. Bay 10 contains further mammalian products in the shape of articles made from bone, hair, bristles, &c. In bay 11 is a fine collection of plumes, feathers, and other ornithological products. Bay 12 is the fisheries court, the most conspicuous feature in it being a collection of models of food fishes of New South Wales. Bay 13 is devoted to insect products, being almost filled with silk (in many varieties and stages), galls and woodborers. Bay 14 also contains insects, and the products of all the lower invertebrates, including a fine set of appliances used in connection with bees and bee-keeping.



MODELS OF EDIBLE FISHES OF NEW SOUTH WALES.

[Painted in Natural Colours.]

(D)—MISCELLANEOUS.

At the entrance bay is a collection of models of ships, boats, &c., illustrating naval architecture in its various branches. Bay 15 contains sanitary appliances. Bays 16 and 17 school furniture and appliances. Bay 19 contains models of machinery and examples of architecture, Bay 20 contains interesting models of flying machines, weapons of war, musical instruments.

From the inspection of the exhibits collected from other countries as well as from Australia it will be seen that in raw products New South Wales compares most favourably, and that in special directions it more than holds its own.

At the late exhibition at Christchurch, New Zealand, the Museum prepared extensive collections of Australian raw products. For this display the highest praise was given, and no less than FIVE GOLD MEDALS WITH CERTIFICATES were awarded to this institution.

At the late Franco-English Exhibition in London, there were displayed even a more extensive collection of the State's Natural Products, and for which display the Museum was awarded the GRAND PRIX AND OTHER TESTIMONIALS.

In this latter connection Messrs. T. A. Coghlan, J. Barling, and J. Davis, Commissioners in London at this Exhibition, in their report on the New South Wales Exhibits, after referring in detail to the Museum collections, conclude as follows:—

“The collection of exhibits sent by the Technological Museum comprised building stones, marbles, and granites dressed for various purposes, illustrations of the use of local stone, granite, and marble in public buildings and works, models of fish, natural pigments, essential oils, and a vast assortment of timbers in the rough and polished, as well as numerous articles made up to demonstrate the uses to which our timbers could be successfully put. The whole exhibit occupied a floor space of 500 square feet, as well as a very considerable wall space. It was, indeed, most creditable to the Curator of the Technological Museum and his Staff. It comprised one of the very finest displays, not only in the Australian Court, but in the whole Exhibition, and was a constant source of interest to visitors of all nationalities. The Commissioners feel that they are only doing bare justice to the Curator of the Technological Museum when they express their deepest appreciation of the excellent service he has rendered to the State in preparing so creditable an exhibit.”

Besides the work previously enumerated as undertaken by the Museum, it may be mentioned that considerable assistance is rendered day by day to the commercial world of New South Wales and neighbouring States on the development of our natural resources and other materials of commerce, and in this connection hundreds of reports are sent out annually.

Extensive collections of specimens of natural history and economic products are distributed among the Public Schools of the State, besides the naming and classifying of thousands of specimens belonging to the schools themselves.

In addition to the Central Museum, there are local Museums at Bathurst, Goulburn, Newcastle, West Maitland, Albury, and Broken Hill.



STAFF OF TECHNOLOGICAL MUSEUM.

Reading from left to right.

Front row (sitting): Mr. Beyer, Clerical Staff; Mr. Smith, Assistant Curator; Mr. Baker, Curator; Mr. Connelly, Clerical Staff.

Back row: Mr. Barnes, Attendant; Mrs. Jenkins, Caretaker; Mr. Holloway, Attendant; Mr. Still, Carpenter; Mr. Waring, Watchman; Mr. Sleeman, Attendant; Mr. Rutherford, Carpenter; Mr. Boardman, Printer; Mr. Cannon, Attendant.

The following were unavoidably absent:—F. H. Taylor, Zoologist C. F. Laseron, Collector; C. Toms, Artist; M. P. Hansen, Attendant; V. Roberts, Attendant

Administrative Branch.

(By GEORGE HOOPER, Assistant Superintendent.)

THE administration connected with the Central College, Country Colleges, Suburban and Country Technical Schools, is undertaken at the offices of the Sydney Technical College, and is under the personal supervision and direction of the Registrar, Mr. A. E. Hibble.

It is essential that there should be a centre of communication, and at present the administrative work is carried on under somewhat disadvantageous circumstances, inasmuch as the provision made for this important section has become altogether inadequate to meet the requirements.

The want of office accommodation is sadly felt, and the occupation of rooms in different parts of the building causes considerable inconvenience. Although the officers work under difficulties, they are looking forward to the time when they will occupy a modern block of buildings specially erected for their work.

It must be recognised that to deal expeditiously with the business, necessary facilities are essential, but as these are not available, the best is done to overcome the difficulties.

It must be borne in mind that there are no less than 113 branches, and the Central College is kept in touch with them by a regular system of correspondence. A report is furnished by the teacher in charge every week. The subjects brought under notice are important and varied. At certain periods of the year the communications emanating from the administrative



STAFF OF THE ADMINISTRATIVE BRANCH.

Reading from left to right—

Front Row: Mr. Murray, Modeller; Mr. Hayes, Clerk; Mr. Bailey, Charge of Inquiry Office; Mr. Hibble, Registrar; Mr. Forbes, Charge of Correspondence; Mr. Pass, Charge of Examination and Statistics; Mr. Clarke, Clerk; Miss Goodere, Librarian.

Second Row: Mrs. Wilkinson; Mr. Brown, Assistant Carpenter; Mr. White, Acting Head Caretaker; Mr. Grunmit, Head Caretaker; Mr. Meredith, Caretaker; Mr. Shambler, College Carpenter; Miss Brown, Caretaker; Mr. Wilkie, Carpenter.

Third Row: Mr. F. Tugwell, Clerk; Mr. Bourke, Telephone Attendant; Mr. Redshaw, Clerk; Mr. Heness, Assistant Operator; Mr. Tremain, Operator; Mr. Leggett, Assistant Operator; Mr. Gant, Assistant Modeller; Mr. Adams, Modeller's Assistant; Mr. Lewis, Caretaker.

On Floor: Master Banwell, Messenger; Master Lloyd, Attendant; Master Dexter, Junior Clerk; Master Gant, Library Assistant.

centre to the Branch Schools and Colleges number some hundreds each week, and to expedite business special work is apportioned to certain officers. By this means urgent and important matters are promptly dealt with, so that no delay occurs.

Each month brings its own particular work in addition to the regular routine business. Necessarily therefore the demands on the clerical staff are great.

Notwithstanding the periodical rushes, no pains are spared by the officers to keep pace and to deal expeditiously with the work.

The three principal sections are (1) Correspondence, (2) Inquiries, (3) Examination and Statistical, and (4) Library. Each of these is under a responsible officer.

(1) The Correspondence Branch is an extremely busy one, and is under the supervision of Mr. E. Forbes, who has been connected with the Technical Branch for nearly five years. He has associated with him Messrs. W. F. Hayes, A. E. Clarke, and J. Dexter. The communications embrace numerous subjects, and these when dissected are relegated to the officer who deals with them. Important documents are registered for future reference, and a complete and comprehensive method of filing papers is in use. This branch is daily growing in importance, and last year no less than 6,785 letters were despatched in addition to several hundred circular memoranda. There were also many other less important letters received which were readily answered by supplying printed matter. Such were not included in the number of letters despatched. The typewriters and copying machines in use are of the latest types. Unfortunately the officers in this branch work under difficulties, as the temporary room which does duty for an office is unsuitable. Under the circumstances they do well.

(2) The Inquiry Office, in charge of Mr. A. B. Bailey, is well known. In addition to answering innumerable questions regarding the classes, students' fees are received and receipts for same issued forthwith. To meet the convenience of the students and the general public, this office is open from 9 a.m. to 8 p.m. each day of the week, Saturday excepted, when it is closed at noon. During the first two weeks of each term the closing hour is extended, as it is found impossible to attend to the large number of students who desire to pay fees in the regular official hours. Matters relating to expenditure and class requirements are also dealt with. In fact the "Inquiry Office" is the bureau of information. It occupies a prominent position in the main entrance of the College. Mr. Bailey has been in charge of this office for over five years. He is assisted by Messrs. F. W. Tugwell and S. Redshaw.

(3) Another feature of the work is that placed under the charge of Mr. Pass, who has been associated with the College for over 22 years. Those who have an intimate knowledge of examinations and preparation of statistics will readily appreciate that the quantity of papers passing through his hands is extremely great. Since the introduction of term examinations the work in this department has been trebled, but notwithstanding that, the system has worked smoothly and given satisfaction. The fee ledgers, examination records, and other matters which are essential for the compilations, are under the care of Mr. W. B. Pass.

(4) The Reference Library contains over 5,500 volumes of scientific, architectural, art, and technical works. Trade journals, proceedings of societies, and magazines issued in the interests of the students following professions and trades, are regularly supplied.

Each year a special sum of money is set apart for the purchase of new technical publications, and the latest text-books. Serial, scientific and trades literature is made a special feature. The periodicals and magazines, &c., are bound each year, and added to the existing fine series.

Good use is made of the fine collection of works, specially by those students who are unable to reach their homes between the hour of leaving work and commencing their classes.

Miss F. Goodere has been Librarian for six years, during which time over 1,500 books have been added to the library.

The library is open for the benefit of teachers and students, from 9 a.m. to 9 p.m. daily, Saturday excepted, when it is closed at noon.

In the country centres it has been found necessary to appoint a committee of prominent residents, one of whom acts as the Honorary Secretary. The requirements of the locality, progress of such classes as may be established, and matters concerning future prospects of technical education are communicated to the central office. By such channels, these outlying branches are kept in constant touch with the Administrating Officer, who is in possession of the

minutest details of the classes. This feature of the work has added considerably to the mass of daily correspondence, but the method of dealing with far distant classes has proved exceedingly beneficial.

The local interest is thus quickened and sustained. Another point in favour of a local representative is that the residents can obtain information regarding the operations of the branch at once. Very often delay occurs when the post has to be resorted to for all sorts of minor inquiries, and this is obviated by the appointment of an energetic Honorary Secretary.

Thus are briefly indicated the general procedure for dealing with the daily routine business of the administrative branch. The staff work very harmoniously together, and are ready at all times to meet emergencies. But for their loyal co-operation it would not be possible to carry on the work which is developing so rapidly. The undermentioned figures will convey some idea of the progress of technical education during the past few years:—

ENROLMENTS.						1895.	1905.	1908.
Sydney Technical College	...	...	...	...	...	3,458	5,605	7,320
Suburban Classes	...	...	...	...	...	550	712	1,352
Country Classes	...	...	...	...	...	2,252	4,030	6,413
Classes connected with Public Schools	...	...	...	...	...	811	4,508	2,392
Totals	...	...	...	...	...	7,071	14,855	17,477

Another phase of administration is the arrangement made for the supply of materials for class requirements. There are no less than thirty-five Technical Art classes established throughout this State.

The casts and other appliances needed are considerable. To meet these needs an expert modelling and casting staff is engaged at the Central College under Mr. A. Murray, who has with him Mr. W. Gant, a skilled mechanic and a product of the modelling classes; also, Messrs. T. Adams and F. Punter. These are being trained by Mr. Murray. In this workshop all kinds of plaster casts from the most elementary, to the advanced art subjects are undertaken. Special courses of models for freehand and model drawing were modelled by Mr. Nelson Illingworth, the well known sculptor, and were prepared in this branch, under the direction of Mr. J. R. Wright, Lecturer in Art, and these are supplied to all technical art classes. Mr. Murray has been associated with this department for over twenty years, and when it is borne in mind that all the classes have been supplied with art subjects, it will be understood that some thousands of plaster models have been sent out by the modeller and his staff. Applications are also regularly received from Queensland, Hobart, New Zealand, &c., for casts, and each year special subjects are ordered for the annual examinations in the sister States.

For many years the lecturers and teachers have illustrated their lectures by means of the lantern. With such a large teaching staff the slides used number thousands. Mr. J. W. Tremain, the College operator, has this section under his charge. He is an expert photographer and maker of lantern slides. Lecturers and teachers submit on a special form, what slides they require, and the requisitions receive consideration. These are taken in order of application (with the exception of urgent ones) and the slides are prepared. In addition to this, Mr. Tremain is responsible for the upkeep and proper record of the apparatus throughout the College. He has also attached to his staff Messrs. W. Leggett and C. Moir. The former was educated and trained at the Goulburn Technical College and was transferred to the Central College because of his special aptitude for lantern work. In addition to other duties the operator, or his assistant, attends at night and manipulates the lantern for the lecturers. Since the introduction of the cinematograph this instrument has been introduced to the College as an aid to teaching. Mr. Tremain occasionally accompanies the Superintendent, as operator, on his country lecturing tours.

Public School teachers are permitted to borrow lantern slides as aids to teaching, and many take advantage of the privilege. The Railway Commissioners have allowed slides to be transmitted to and from the College free of charge. Teachers also bring their elder scholars and special lectures are given in the College Lecture Hall by either a College lecturer or a teacher.

It should be added that most of the illustrations and portraits in this monograph are from daylight and flashlight photographs taken by Mr. Tremain.

The numerous changes consequent upon alterations, and additions to the premises, give ample scope for the services of a sign-writer and painter. Moreover, the number of diagrams, photographs, and other illustrations needed by the teachers, is assuming large proportions, so that the constant applications for such work demanded an appointment. Mr. I. G. Heness, although at present designated assistant operator, was appointed to undertake this work under the joint guidance of Mr. C. Toms, assistant in the Decorative Art Department, and Mr. C. Shambler, the College carpenter. The advantage of having an officer who can carry out such a variety of work, including staining, varnishing, French-polishing, and general painting, is apparent, and a wide field of usefulness is open to him. Mr. Heness is doing good service, and the teachers are appreciating his assistance.

One of the best known officers is Mr. C. Shambler, the College carpenter. The official designation does not, however, rightly interpret the varied duties which he is called upon to perform. When lecturers or teachers require a special piece of apparatus to illustrate some complicated experiment, the services of Mr. Shambler are always readily available. His long association with the College, and the numerous calls he receives, have made him an officer of repute. The constant extensions of the classes, and the many alterations which are continually going on, keep him more than fully occupied. For several years Mr. Shambler acted as assistant teacher of carpentry at the evening classes, but the night work in addition to his daily duty proved too much, his health suffered, and he was, therefore, compelled to relinquish the teaching. Mr. Shambler has an excellent lieutenant in Mr. A. H. Brown. For seven years he has been a fellow workman, and shared the arduous labours of his chief. Mr. Brown is also engaged as an assistant teacher of the carpentry night classes. The services of these officers, especially during exhibition times, are in great demand, and they are always willing to meet emergencies.

The care and cleanliness of the buildings cause no little anxiety. Situated as the premises are amidst an industrial centre, the dust is always a source of trouble. For many years a staff of cleaners and caretakers has been under the charge of Mr. James Grummitt, who was taken over from the School of Arts, when the Technical College was placed under the control of the Board of Technical Education. After twenty-five years' service Mr. Grummitt has been granted leave of absence prior to his retirement from the position of Head Caretaker. During these years of faithful service Mr. Grummitt was equal to the demands made upon him, and also ready to work night and day for the institution with which he was connected so many years. Mr. E. F. White is now acting head-caretaker, and has Messrs. F. Meredith, W. Wilson, A. Lewis, and Miss Brown, Mrs. Teare, and Mrs. Wilkinson as his assistants. The numerous rooms, laboratories and workshops necessitate constant cleaning, and it has been found necessary to have sufficient attendants to enable the whole of the buildings to be cleaned thoroughly every day. At regular intervals the floors are scrubbed and disinfected, and every reasonable precaution is taken to keep the premises in a cleanly condition. This entails heavy work upon the staff, but Mr. White is well supported in his efforts by those associated with him, and they do their best to maintain the good reputation of the College. The caretakers are also responsible for the lighting up and turning out of the gas.

When defects in the gaslight are seen, the matter is made known to Mr. W. Nelson, the teacher of plumbing, who very quickly arranges with the College plumbers to make good any deficiency. The gas and water services of the College and suburban schools are also under the care of Mr. Nelson, and the necessary repairs and extensions are carried out under his direction by the College plumbers, Messrs. W. Patino and D. Auld, who are members of the College staff, and are also assistant teachers of plumbing; the whole of these officers being under the general supervision of Mr. Bruce, the lecturer-in-charge of the Department of Sanitation, which includes the plumbing classes.

Gradually the electric light is being installed throughout the College, under the direction of Mr. R. Simpson, lecturer-in-charge of the Electrical Engineering Department. Mr. G. B. Hill's special duties are those connected with the electric lighting plant, and he is responsible for its nightly working. The workshops, and a portion of the main building have been provided with electric lights, and this installation necessitates Mr. Hill's attendance nightly.

Separate Classes.

BOOTMAKING SCHOOL, ERSKINEVILLE.

By H. LEWIS, Teacher of Class.

ESTABLISHED under the regime of Mr. Knibbs in 1906, these classes have been found to provide a long-felt want for the technical education of the worker in the Shoe Trade.

The scheme was not, however, complete till March, 1908, when the installation of machinery made it possible to teach the whole of the branches of modern shoe-making.

This installation was made the occasion for a visit to the School by the Hon. J. A. Hogue and Mr. Hollis, M.L.A., and speeches were made by these gentlemen and the Superintendent, Mr. Turner, which marked the development of Boot Trade Education in Australia.

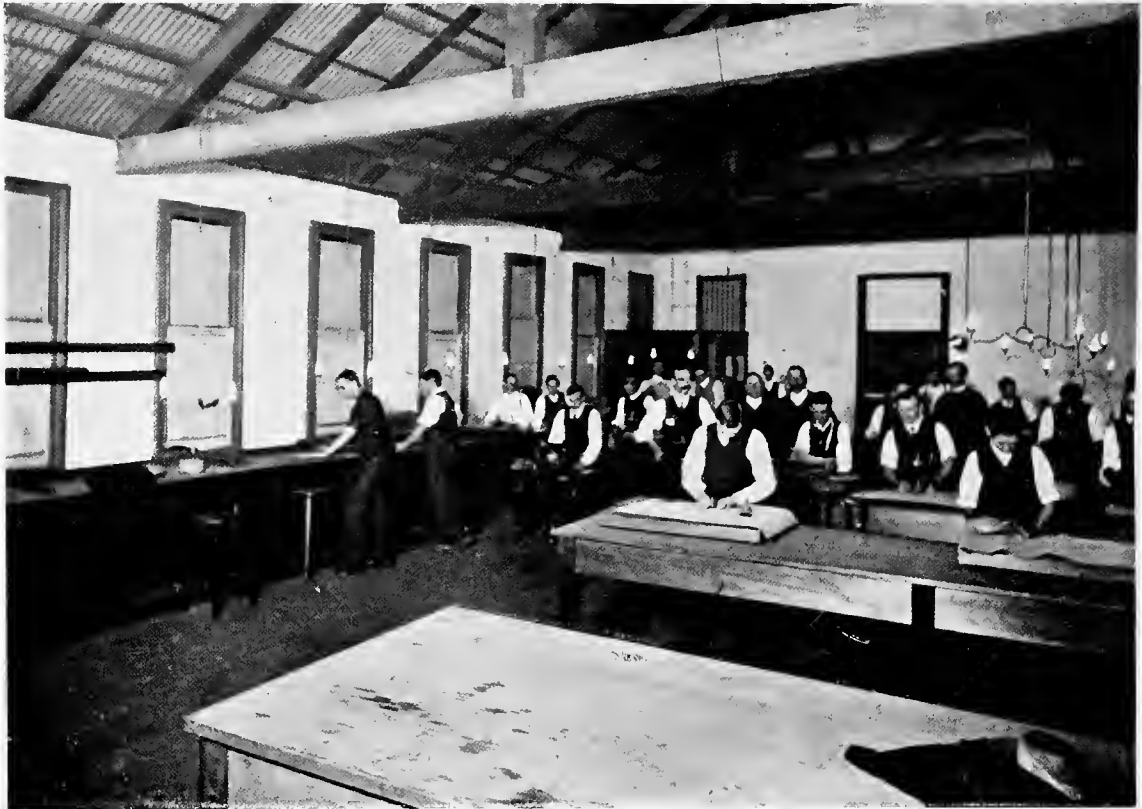


BOOTMAKING SCHOOL, ERSKINEVILLE.
Exterior View.

ACCOMMODATION AND EQUIPMENT.

The building (situated opposite Erskineville Railway Station) is a fine two-storied structure, about 50 ft. x 30 ft., specially designed, with all conveniences for a model shoe factory.

The power provided is a 6 h.-p. gas engine. The machinery installed by the United Shoe Machinery Co. of America, is of the latest and most up-to-date pattern.



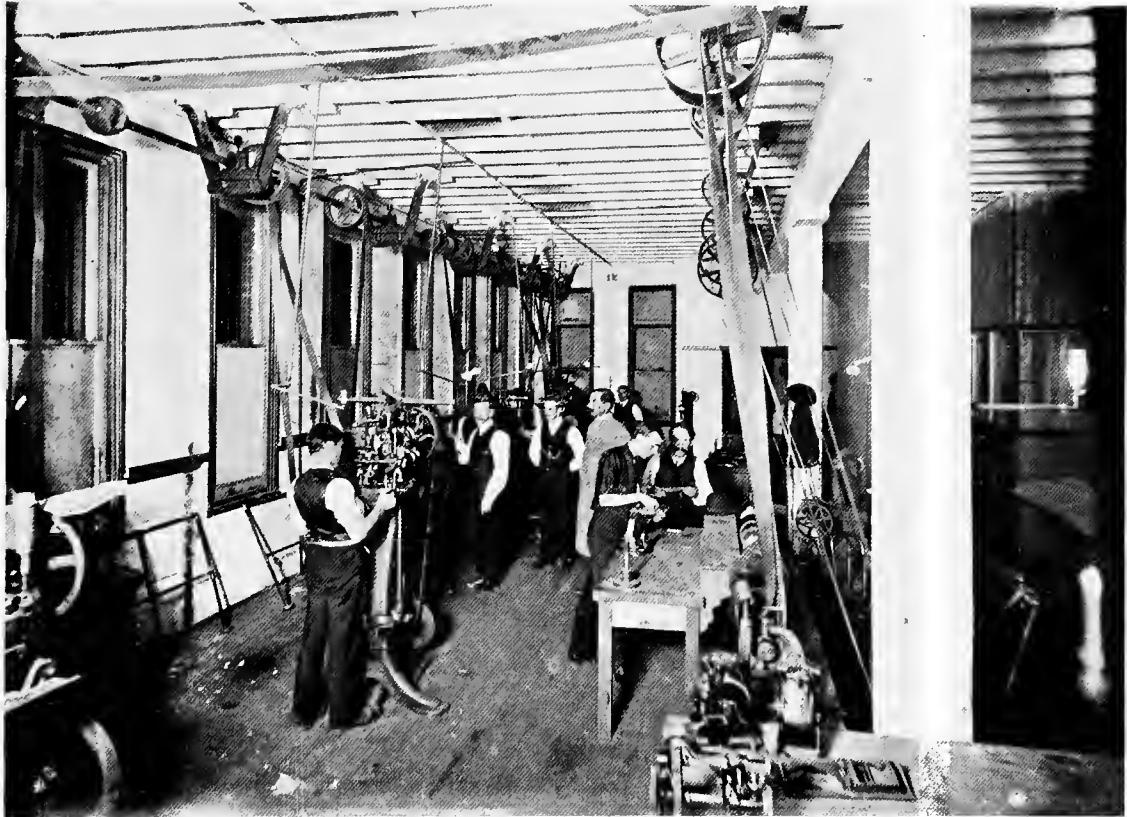
BOOTMAKING CLASS PATTERN-CUTTING AND CLICKING ROOM.

The upper floor is fitted up as a lecture-room, and tables for the pattern-cutting and clicking rooms. In the picture are shown the students engaged designing and cutting paper patterns to the lasts provided. There is also to be found here the pattern shears for cutting the iron patterns used in the factory; also skiving and folding machines for producing a finish to the shoe upper.

On the ground floor is seen the making and finishing machinery—eighteen machines being provided, giving some idea of the detail and subdivision of the present-day shoe factory.

There are rapid-action presses for cutting out the soles; rolling and splitting machines to ensure an even substance of leather, stitching machines of several descriptions, capable of doing the work equal to the very best hand-sewing, but with a regularity and accuracy hitherto unapproached.

In the view a corner only of this room is shown, but includes the hand-lasting machine in the foreground. The heeling machine is also shown, which makes and secures the heel to the boot in a lightning fashion as its name signifies. The slugging machine rivets on the top-



BOOTMAKING CLASS: THE MACHINE ROOM.

pieces of the heel. The heel and sole trimming machines are marvels of ingenuity, revolving some thousands of times a minute, and carrying circular cutters and a fan to take away all dust. The edge-cutting and bottom-buffing machines with revolving pads and brushes make this an exceedingly interesting hive of industry, and completes the finish of the shoe.

TEACHING.

The course consists of two-years' instruction for each class. These classes number five, and are designated:—(1) Pattern-cutting, (2) Clicking, (3) Blake Machine, (4) Goodyear Welted, (5) Finishing.

The making of the modern shoe calls for much technical knowledge and intelligent application, and the trade is full of opportunities for young men of ability who are anxious to advance themselves.

The opportunity which rarely comes in the factory is provided, viz., to obtain technical knowledge of every operation and the principle involved.

The syllabus is modelled on the lines of the City and Guilds of London Institute, and Mr. T. Y. Golding's work on the Manufacture of Shoes is taken as a text-book in the pattern-cutting and theoretical teaching.

SUPPORT BY MANUFACTURERS.

The classes are receiving the thorough support of the Manufacturers' Association, and many are providing work for the practical operations of the machines. Work is also provided by the Government in the form of boots for the Police Department, which are made by the students.

ENROLMENTS.

Average for last year (three terms):—Pattern-cutting, 17; Clicking, 17; Blake, 13; Goodyear, 18; Finishing, 7; total enrolment, 72.

SADDLERY CLASS.

By MR. F. J. ANDREW, Teacher of Class.

THE course of instruction in Saddlery and Harness-making is specially adapted to impart to Improvers and Apprentices a thorough and practical insight of their work.

A technical knowledge of the nature of the materials used and practical demonstration of how to apply them to advantage in the manufacture of the various articles required.

How to measure and fit a horse with saddle, harness, collar, or boot, as the case may be, are all matters which receive special attention.

The names of tools and their use, and how to keep them in good order.

Exercises in bridle cutting and strapping.

Harness-making (light or heavy), carriage pads, buggy saddles, pipe loop creasing, &c.

Saddle-making—stock, side, jockey, &c.

Counterlining and repairing.

General cutting, pattern cutting, &c.

Lectures on general trade topics at intervals.

PROGRAMME OF CLASSES AT ERSKINEVILLE TECHNICAL SCHOOL,

TECHNICAL BOOT-MAKING SCHOOL (near Railway Station)—H. Lewis, Teacher—Pattern-cutting and clicking, Tuesday and Thursday, 7.30 to 9 p.m. Other Classes will be formed if sufficient students apply.

DRESSMAKING—Miss Blake, Wednesday, 7 to 9 p.m., Friday, 4 to 6 p.m. Fees, 15s. per term for one lesson, 25s. for two lessons.

SADDLERY AND HARNESS MAKING—F. J. Andrew, Monday, 7 to 9 p.m.

BREADMAKING.

(By DR. CHAPMAN, Lecturer to Class.)



DR. CHAPMAN,
Lecturer in Breadmaking.

THE class in Breadmaking is conducted to give an account of the chemical, physical, and biological principles which lie at the basis of the art of making bread. The properties of flour, bread, and their components serve to introduce the study of simple chemical phenomena. The preparation and examination of yeasts leads to the study of fermentation. The investigation of moulds is made the foundation of elementary knowledge in bacteriology. Reference is made to the physical properties of gases, liquids, and solids. A short study of the physics of heat is made from the use of the thermometer, and the preparation of fluids of known temperature. The application of these principles to the various stages in making bread is pointed out, and stress is laid on those requirements which pave the way to the preparation of a more perfect loaf.

COAL-MINING CLASSES.

JON. MAY, M.E., Teacher of Coal-mining, Southern District.

CLASSES for instruction in the Science and Art of Coal-mining were established under the Technical Education Department of New South Wales in the Newcastle District in 1890, in the Illawarra District in February, 1900, and later at Lithgow. The State Government, by this means, placed within the reach of each boy and man engaged in coal-mining an opportunity for acquiring a knowledge of the scientific principles adapted to his particular work, thus supplementing the training that goes to cultivate the powers, guide the mind, and form the character,—the goal of primary education.

In each populous centre, on a class in coal-mining being established, the place of meeting is always arranged for the convenience of the majority of the students, but this is almost invariably a room of the village school, which, being easily lit by a lamp, suspended from the ceiling, of the mammoth Miller pattern, has forms, desks, and blackboards adapted for the classwork.

The students (working miners) have often to travel a total of 4 miles to and from their work, which after a hard day's work at the coal-face entitles them to every consideration of comfort, or making the class convenient to their homes. The teacher goes to the class, not the class to the teacher.



MR. MAY,
Teacher of Coal-mining, Southern District.

In arranging their studies for home and classwork, it is generally kept in view that a large majority have had to re-commence their education on joining the classes, and, therefore, the class must supply most of the requirements of the ideal Continuation School. The object of the classes being to give instruction in Mining and its associated sciences, those subjects are carefully arranged and classified to cover the three terms into which the year is arranged. The syllabus, arranged some fourteen years ago, and annually corrected as required, was designed as a guide to the student's reading and home studies, as well as the work in the lecture-room. In the various subjects included in Coal-mining and its associated sciences, there is ample room for the teacher's discretion, in selecting just that phase of the different subjects adapted to the student's or the classes' progress. Mining Geology, from the Devonian to the Triassic, which includes the Permo-Carboniferous coalfields of New South Wales in general physiographic and stratiographic outline, but particularly the local features characteristic of the principal places of mining development, as Illawarra, Lithgow, Newcastle, or Maitland, with the relative position of their workable seams.

Boring by hand or machinery, sinking by ordinary methods, or by compressed air, or by the freezing process; the methods of laying out mines with the different modes of working and ventilation; the effects of coal-dust on explosions, with the lighting of mines, or the explosives used in mining; the transmission of power by compressed air, or electricity, hydraulic, or other methods; the capacity and resistance of airways, carrying the large volumes of air in modern mining, or the capacity resistance, and insulation of electric cables carrying from 200 to 2,000 volts; winding machinery which occasionally approximates a mile per minute, with fan machinery occasionally producing 600 tons of air per hour; the strength of ropes; the design of engines or boilers.

Mine Surveying and Mensuration, by which the student is instructed to make his own surveys of a branch line from his mine to the main railway; to compute the contents of its cuttings, to lay out its curves to connect his surface boundary lines with the underground workings; to make a neat and accurate plan.

This general outline of the mode and extent of the instruction given in the Mining classes applies to each mining centre—Newcastle, Illawarra, and Lithgow—for, with the exception of Helensburgh and the new Balmain mine, the conditions and methods of working are practically identical in those districts.

The miners who attend the classes at each centre are generally familiar with the modes of mining practised in the other districts.

The students who principally take advantage of the opportunities offered, are generally the mining officials—as deputies, road-men, and those other miners who, from their intelligence, energy, and force of character, supply the material for filling up the official positions. The incentive offered to this higher type of miners has been vastly strengthened by the Mines Act of 1896, making it compulsory for the manager and underground manager to hold certificates of competency.

The following analysis of the subjects required for a first class certificate under the Coal Mines Act, will indicate the subjects which the Mining Class must deal with, and the proportional value attached to each:—

Mining	25%	Geology	8%
Ventilation	15%	Arithmetic	8%
Applied Mechanics	11½%	Mine Gases	5%
Coal Mines Act	10%		
Surveying	9%	Total	100
Electricity	8½%		

This is at once an indication of the subjects required to be taught by the Mining Classes, and also a means of testing the success of the efforts by the Technical Education Department to supply this want.

Of the 90 certificates of competency for colliery managers registered, 45 are held by old students of the Mining Classes, while out of 140 certificates of competency as underground managers registered, 62 are held by old students of the Mining Classes. This list is growing yearly, and is keeping pace with the growth of the coal-mining industry.

Thus, the State of New South Wales faces the twentieth century with an annual output of 9,000,000 tons from her coalfields, which are computed to contain 130 billion tons, and does so in the full assurance that her storehouse of latent mechanical energy, when exploited, shall not only be under the best safety and sanitary conditions for the workman, but that the methods of working shall be on the lines laid down by the best science and practice of modern coal-mining.

A list of old students of the Mining Classes to whom certificates of competency as managers of mines have been granted under the Coal Mines Regulation Act of 1896 is herewith appended:—

Arbuckle, R., Manager, Pelaw Main Colliery; Batey, G. W., Surveyor, Coledale Colliery; Baxter, R., Manager, Gunnedah Colliery; Broadhead, M., Manager, Balmain; Collins, V. B., Teacher Coal-mining, Newcastle; Croudace, S., Manager, Durham Colliery; Davies, D., Assistant Under-Manager, South Bulli Colliery; Douglas, J., Manager, Colliery; Durie, G., Manager, Stockton Colliery; Durie, G., junior, Manager, Minmi Colliery; Durie, John, Manager, Lithgow Colliery; Evans, M., Manager; Evans, John, Engineer, Pelaw Main Colliery; Gibson, R., Under-Manager, Lithgow Colliery; Henwood, J., Manager, Seaham Colliery; Hindley, A., Under-Manager, Teralba Colliery; Hindmarsh, J. P., Collieries Inspector, Illawarra; Hotchkis, D., Under-Manager, Mt. Kembla; Hutton, J. G., Collieries Inspector, Newcastle; Jones, C., Manager, Colliery; Jones, W. E., Manager, Colliery; Jubb, H., Manager, Colliery; Kirk, A. E., Manager, Colliery; Lawson, W., Manager, Seaham Colliery; Ledger, W., Manager, Colliery; Leitch, G., Manager, West Australian Mine; Mathison, J., Manager; Miller, A. J., Manager, South Greta Colliery; Morgan, W. H., Surveyor, Teralba Colliery; McLeish, J., Colliery; Philpot, W. T., Manager, Lithgow Colliery; Rowe, J. S., Manager, Helensburgh Colliery; Scott, R., Manager, Hebburn Colliery; Snedden, W., Manager, Teralba Colliery; Stokes, R., Manager, Tasmanian Colliery; Tennant, J. T., Collieries Inspector, Newcastle; Thomas, F. G., Manager, Burwood Extended; Thomas, H. J., Manager, Glebe Colliery; Thomas, R.; Warburton, A. E., Manager, Colliery; Warburton, S. H., Surveyor, Caledonian Company; Watson, J. T., Collieries Inspector; Watson, J., Under-Manager, Glebe Colliery; Williams, H. M., Manager, East Greta Colliery; Youll, G. C., Manager, Bulli Colliery.

A list of old students of the Mining Classes to whom certificates of competency have been granted as Under-Managers:—

Archibald, A.; Bailey, J. W.; Biggars, C. H.; Bissell, T., Underground-Manager, Mount Kiera; Bivens, C., Underground-Manager; Blacklock, J.; Burrell, G., Underground-Manager, Pelaw Main; Campbell, T.; Cavill, A.; Dobb, B.; Dodd, W.; Duncan, R.; Durie, D.;

Durie, J.; Emery, J.; Errington, J. R.; Eyeington, G.; Frost, A., Frost, E.; Gibson, J.; Graham, R.; Harrison, G.; Hay, G.; Hay, W.; Hendry, J.; Hindley, R.; Hobbs, T.; Horsey, W.; Howie, R. S.; Jeffries, J.; Johnson, T.; Jones, H.; Jurie, R.; Kerr, W.; Kirk, A.; Meurant, E.; McAteer, J.; McDonald, W.; McVee, J.; Munroe, D.; Palfreyman, C.; Peckham, J.; Philpotts, W. T.; Prosser, W.; Rees, J.; Rees, W. T.; Robinson, J.; Rowe, C. B.; Ryle, J. E.; Scobie, I.; Shilden, W.; Sheppard, R.; Snedden, A.; Swan, J.; Tate, H.; Tubman, W.; Vallance, A.; Vardy, R.; Welford, T.; Wilson, J.; Wilson, W.; Young, F.

PROGRAMME OF CLASSES, ILLAWARRA DISTRICT..

Teacher in Charge : W. V. BROWN, B.A.

Classes are held as follow:—

ALGEBRA, ARITHMETIC—W. V. Brown, B.A. (Wollongong)
 DRESSMAKING—Miss Smallwood (Balgownie, Nowra, Kiama, Wollongong, Berry, Dapto). (See also Granville).
 MILLINERY—(Albion Park, Berry, Nowra, Kiama, Wollongong).
 MECHANICAL DRAWING—Jonathan May, M.E. (Wollongong).
 COAL MINING AND MINE SURVEYING—Jonathan May, M.E. (Woonona Public School, Corrimal Public School, Helensburgh Public School, Wollongong Technical School).
 MECHANICAL DRAWING AND MACHINE DESIGN—Jonathan May, M.E. (Wollongong Technical School, Corrimal Public School, Woonona Public School).
 MODEL AND FREEHAND DRAWING—Mr. Ferguson (Wollongong).
 COOKING—Miss McRae, (Wollongong, Kiama, Nowra).
 DRESSMAKING, at Public School (Dapto)—Miss Smallwood.
 DRESSMAKING, at Public School (Kiama)—Miss Smallwood.

ELOCUTION AND VOICE PRODUCTION.

(By MISS M. G. STAFFORD, Teacher of Class.)

THE aim of this class is to give the student a thorough knowledge of the voice and its production, and of the theory and practice of Elocution (recitation and public speaking). A portion of each lesson is occupied by a short lecture upon the following divisions of the subject.

- (a) *Voice Production*.—The organs of respiration and their functions, the vocal organs and their respective functions, resonance, tone, pitch, &c.
- (b) Articulation and pronunciation.
- (c) *Expression*; inflection, modulation, pause, emphasis, &c.
- (d) *Delivery*.—Gesture and looks.
- (e) The emotions and their expression.

Each student prepares a selection—prose or poetry—which he recites before the class applying the knowledge gained from the lectures. His work is then criticised and connected.

The benefits gained from the study of Elocution by the student are many. In every call of life business is carried on by words spoken by the human voice, and the man with the cultivated voice, the distinct, pure, effective articulation, the free earnest delivery, is the one who is most successful. Then every man is called upon while fulfilling his duties to convince the judgment of his hearers of the truth and soundness of his views, and to persuade them to a certain course of conduct or action; consequently, the knowledge of voice production and elocution is invaluable. Besides the effect upon others, there are the reflex advantages upon oneself, both mentally and physically.

An eminent American physician asserts that the practice of elocution and public speaking, when not carried to extreme exhaustion, is the best form of gymnastics known; it exercises every inch of the man from the highest region of the brain to the smallest muscle.

The class is conducted in a large well-lighted room at the College. Excellent models and diagrams of the vocal and respiratory organs are supplied for the use of the students.

PROGRAMME OF CLASS.

ELOCUTION—Miss M. G. Stafford, Thursday, 7 to 9 p.m. Fees, 10s. 6d. per term.

LEATHER DRESSING AND TANNING CLASSES.

(By THE ASSISTANT SUPERINTENDENT.)

THE importance of the industry connected with Tanning and Leather Dressing has been recognised for many years. In this State no provision had been made until recently for giving technical instruction in the manufacture of leather, although it was generally understood that those employed in the tanneries needed the scientific teaching.

Towards the end of 1907 efforts were made to ascertain what support was likely to be given to the classes, if established. Public meetings were held at Botany, Granville, and Willoughby. The mayors of these respective municipalities presided. Subsequent meetings took place, and sufficient students were forthcoming to warrant steps being taken for the formation of these classes. Representations were made to the Minister of Public Instruction who approved of their establishment.

Unforeseen circumstances arose which delayed the appointment of an Instructor; but as the result of widely advertising, the services of Mr. Coombs were secured.

Mr. Coombs has been occupied for some time in the preparation of a suitable course of lectures, and arranging for practical demonstrations, and his syllabus is published below. It has been thought advisable to concentrate the teaching, and a central building is being procured, wherein both the theoretical, practical, and experimental work can be carried on.

SYLLABUS OF CLASSES, &c.

(By F. A. COOMBS, Lecturer-in-Charge.)

Raw material—Structure of hides—Water—Chemical properties of material used in beam-shed—Soaking—Softening—Unhairing with lime, sulphide of sodium, and arsenic—plumping and its causes—Neutralizing lime, sodium, and arsenic—Bating and drenching.

Vegetable tanning—Chemical properties of tannins—Catechol—Pyrogallol and mixed tanning agents. Tanning materials—Their sources and quality, and quality of tanning available.

Sole-leather, unhairing with lime and sodium mixed, lime and sodium, neutralizing with acids—Plumping in tan-pits—Acidity of tan-liquors, and effect on hides. Laying away—English and American methods, Colonial methods.

Chrome tannage, soaking—Unhairing—Bating—Pickling—Chemistry of chromium compounds—One-bath and two-bath processes—Fat-liquoring—Dyeing—Drying—Glazing—Softening finishes. Chrome sole-leather, chrome-coat, calf, and sides—Making up chrome finishes.

Dyeing and staining—Sheepskins—Calf—Sides. Mixing colours—Basic dyes—Acid dyes—Albumen finishes, &c.

Tanning pickled pelts—New Zealand pelts—Method of pickling—Neutralizing acid—Tanning—Combination tannages. White leather.

MACHINES.

The machines to be used will consist of:—1 tanner's drum, 1 glazing machine, and 1 shaving machine.

SCOPE OF THE WORK.

Both employers and employees are taking an interest in these classes, and among the students enrolled are represented masters, tanners, and workers.

New South Wales produces large quantities of hides and pelts, the majority being exported.

This exported raw material goes to America, Germany, and England to keep their large manufacturing centres working. These supply the world with the finished leather. We are faced with the question, "Why is this raw material not finished in Australia?" In the first

place our tanners cannot compete with their rivals in the old world, as regards the cost of production, and, secondly, the tanner in the old world is far better equipped through technical education, and has the advice of skilled chemists.

Chrome tanning, which is the method now in vogue for tanning the best grades of leather, was introduced to the trade by a chemist, and it is quite plain that a knowledge of chemistry is an essential factor in the production of this leather.

Technical education in this branch having for its aim practical demonstrations of the manufacture of the latest and improved leathers, must be of great help to the tanners, and will give the trade in this State a better chance to compete with outsiders, not only by helping the tanner, but by raising the standard of skilled labour.

The value of this trade to the State must be apparent, when we consider the large number of hides and pelts produced. This production of raw material is on a very solid basis, and is likely to be so for a considerable time.

Under the present conditions a large part of one of our best assets goes to swell the population and increase the wealth of foreign countries, through the inability of a young country to use up its surplus of raw material; but it is only a matter of time till Australia will manufacture her own raw material, and export the surplus as a finished article.

The length of time before this comes to pass will be determined by the skill and energy of her people, and that skill and energy must be guided to a great extent by technical education in its most practical form.

PHOTOGRAPHY CLASS.

(R. H. B. BRANGWIN, Teacher.)

Cameras and Accessories; Photographic Lenses; their construction and different uses. *Dry-plates.*—Uses of different speeds, exposures, accelerators, restrainers, and intensifiers; reducing and fixing. *Negatives.*—Correct densities for various uses, improving for printing; spotting, blocking out, varnishing; reason of defects and their remedies. *Developing.*—Practical demonstrations of the different methods, Watkins' Factor System, daylight tank development for films and plates. *Printing out Papers.*—Sensitised, albumenised, gelatino chloride (P.O.P.). ferro prussiate (blue printing), toning and fixing. *Bromide and Gaslight Papers.*—Printing, masking, vignetting, developing, fixing, and toning. *Lantern Slides, and Transparencies* by contact and reduction, colouring, toning, and mounting. *Enlarging.*—Daylight and artificial light on paper, opal; making enlarged negatives; copying prints and diagrams. *Finishing Prints.*—Spotting, squeegeeing, enamelling, and different methods of mounting. *Indoor and Flashlight Photography,* including home portraiture. *Carbon process.*—Sensitising tissue, exposing under negative, transferring to different supports. *Retouching,* and general improvement of negatives; use of retoucher's knife, pencils, stumps &c., and correct use of retouching desk. *Platinotype Process.*—Printing, developing, and different modifications of same. *Photographic Apparatus,* fully explained with aid of models and diagrams.

N.B.—Any new processes in connection with this class that may be introduced to the public will be explained by the teacher in charge. Practical outdoor lessons on Saturday afternoons by arrangement with teacher.

For about seventeen years until the end of 1905 Photography was included in the Syllabus of Photo-lithography, under the direction of Mr. A. A. Lawson. At the beginning of the year 1905, there being quite a number of applications for instruction in Photography, it was thought desirable to have one evening a week for this subject, apart from Lithography and Photo-lithography. An Assistant was appointed for this branch. At the end of 1905, Mr. A. A. Lawson resigned his position as teacher in charge. It was then suggested to the Superintendent that the Photographic Class should be entirely separate from the Photo-litho. class, as so many intending students would not join on account of having to take a course of Photo-lithography, which to the amateur was of no use whatever, the result being that a Photographic Class was formed at the beginning of the year 1907, with a teacher in charge of it. For the 1st and 2nd term of that year (1907) two evenings a week were devoted to this

subject, but at the end of the year on account of want of space for other subjects, this class had to be held on one night a week only. The Photographic Class is very different to most of the classes taught at the College, inasmuch as nearly all the students are amateurs, and only join to get sufficient information to turn out good and presentable work, and not to become proficient as professionals, although some few of the students are now taking up Photography as a means of livelihood, and are reaping the benefit of the knowledge gained at the College.

This class is somewhat handicapped on account of having to be held at night, as daylight is a most important factor in this branch of science. It makes it somewhat difficult for the teacher to impart the knowledge to the student and the manipulations of the different apparatus used, but judging from the number who have passed at the annual examinations, it is quite evident that the students obtain a good knowledge of the science both as regards the theory and practice.

By a perusal of the Syllabus for 1909, which heads this description, it will be seen that it embraces almost all that either amateur or professional is likely to wish to learn.

The teacher of this class has been (like all the teachers connected with the College classes) selected from the best that could be found, not only for the knowledge he may have of the subject he has to teach, but for the ability to impart his knowledge—a most important point in the selection of such a teacher.

Mr. Brangwin, who is in charge of this class, is a thoroughly practical man, and up-to-date in all he teaches, and he makes his lessons pleasant as well as instructive, with the assistance of apparatus, models, diagrams, &c. He is in a position to be in touch with all the new apparatus and modern information connected with photography, and the students under his care have the benefit of this. It will be also seen by the Syllabus that Saturday afternoon outings are arranged with the students, so that they can get some practical work outside in the daylight, the teacher taking charge and giving all the instruction that may be needed. As photography has become such a necessary and useful adjunct to almost every trade and profession, and to the scientist, it is to be hoped that the instruction to be gained at the Technical College, in the particular branch, will be taken advantage of more than it has been.

PROGRAMME OF CLASS.

PHOTOGRAPHY.

*PHOTOGRAPHY —R. H. B. Brangwin, Tuesday, 7.30 to 9 p.m. Saturday afternoons as arranged.

* Fees, Senior Scale.

RAIL CARRIAGE BUILDING.

(By A. C. COOPER, Teacher of Class.)

THE course of instruction, which is arranged to suit the needs of both elementary and advanced students embraces the following subjects:—

- (1) The setting out of working drawings in a ready and practical manner, full size to scale, and from rough sketches.
- (2) The use of different kinds of tools and wood-working machinery, with a view to the most useful and economical application.
- (3) The qualities and capabilities of different kinds of timber in general use, and the best methods of storing and seasoning the same.
- (4) The properties of iron, steel, and other metals, with their most advantageous use, and the best methods of working these metals.

The class-room is fitted with benches, tools, wood-working machinery, drawing and blackboards.

PROGRAMME OF CLASS.

CARRIAGE BUILDING —A. C. Cooper, Monday, 7 to 9 p.m.

TAILORS' CUTTING CLASS.

(By A. BURNHAM, Teacher of Class.)

AFTER an interval of a number of years, this class was re-formed during the latter part of 1906, under the direction of the writer. A course of instruction extending over two years has been arranged, and is divided into two stages, viz.: First year, "Ordinary"; Second year, "Advanced." Students are first given a general explanation of cutting, taught the uses of the tape, chalk, and square; the human figure, normal and abnormal; considerations for adjusting deformities; methods of measuring, and the application of measures for drafting. During the first year students receive instruction in the cutting of the following garments:—

**THE TAILORS' CUTTING CLASS-ROOM.**

Mr. Burnham with his Students at work.

Trousers (various styles); Breeches, Gaiters, and Pantaloon; Vests (single and double breasted, with collars for same); Coats: sac, morning, D.B., frock, and dust.

Second-year students receive special instruction in the cutting of Clerical Dress, uniforms for various purposes, the adjustment of misfitting garments, and methods to correct errors.

The advantage of a Technical College Education in the art of Tailors' Cutting is that a student receives a thorough knowledge not only of the System of Cutting, but of the various alterations and variations as well, thus enabling him to become a first-class Cutter, competent to fit any figure which he may be called upon to deal with. A full course of Tailors' Cutting, as provided at the Technical College, presents a student with far greater facilities than those he would meet with if he decided to undergo a course of private tuition, the former being a two

year course, and the latter a course of six months at the most. In both cases the student obtains the knowledge of the System of Cutting, but in the case of the privately taught student the training period is so short that he only really obtains a surface knowledge of the Art, whereas the student of the Technical College has time to become thoroughly acquainted with the System, and has so, to a certain degree, become master of the intricacies of the Art; so that with regard to Tailors' Cutting the System of Technical Education has considerable advantages over that of private tuition as at present available. There are some students who attend the class for a limited period only, in order to gain some special information, and having obtained this knowledge, do not return. In such cases while good work is done at the class it is not officially recorded.

The following students have been successful in obtaining positions through the instruction they have received at the College:—Mr. Arthur Barrett, junior cutter at Messrs. Esling and Barrett, Inverell, N.S.W.; Mr. Arthur Richard, junior cutter at H. J. Cohen & Co., Sydney.

In June, 1908, the number of students had increased to such an extent that it became necessary to appoint an Assistant Teacher, and Mr. Ernest A. Page, a distinguished student of the class, was appointed to the position.

The class is conducted in two large, well-lighted, and airy rooms, the students taking up positions around high tables which are convenient for drafting upon. There is also a large press in the room in which the students may keep their drafting materials, &c.

Each student provides himself with the following tools of trade:—One graduated square, one trouser rule 45 inches in length, one tape measure, French chalk, and a piece of tweed and brown paper for drafting on.

PROGRAMME OF CLASS.

TAILORS' CUTTING CLASS.

TAILORS' CUTTING—A. Burnham, Monday, Tuesday, Wednesday, and Thursday, 7 to 9 p.m. Fees, 15s. per term for one Lesson per week; 25s. per term for two Lessons per week.

Suburban Technical Schools.

FROM time to time Technical District Schools have been established in the suburbs surrounding Sydney; among these the Petersham School deserves special mention as being the first of those constituted, teaching of this character having been commenced by Mr. W. J. Thomas—the Art Master still in charge—as far back as the year 1884. Mr. Thomas is one of the pioneer teachers of the Technical Art Classes in this State, having been appointed by the late Technical Education Board in 1884, and he also acted as Examiner to the Department of Public Instruction in Art subjects for many years.

The illustration shows portraits of Mr. Thomas and his present staff at Petersham school.

As indicating the scope of the work carried on at those suburban schools, the following note of the various schools now in operation around Sydney, and of the classes held therein, will be of interest:—It should be added that most of the teachers in those schools are also teachers in the Sydney Technical College—



STAFF OF PETERSHAM TECHNICAL SCHOOL.
From left to right—Mr. Stuart, Shorthand;
Mr. Thomas, Art Master in charge; Mr.
Bender, Book-keeping and Mathematics.

PETERSHAM, LEICHHARDT, AND DISTRICT TECHNICAL SCHOOL.

Classes meet at Crystal-street, Petersham.

ART MASTER—W. J. Thomas.

FREEHAND DRAWING, MODEL, BLACK AND WHITE DRAWING, ANTIQUE AND PLANT DRAWING AND DESIGN;
MECHANICAL DRAWING, ARCHITECTURAL DRAWING, PRACTICAL, PLANE, AND SOLID GEOMETRY,
PERSPECTIVE.

DRESSMAKING—Miss Dove. SHORTHAND—F. W. Jonson, F.I.P.S. BOOK-KEEPING—F. Bender.
MATHEMATICS as arranged.

ASHFIELD TECHNICAL SCHOOL.

Classes meet at Public School, Ashfield.

FREEHAND DRAWING, MODEL DRAWING, ARCHITECTURAL DRAWING, TRADES DRAWING, MECHANICAL DRAWING,
MODELLING, GEOMETRICAL DRAWING AND PERSPECTIVE—H. Gardiner-Garden.

PENMANSHIP, BOOK-KEEPING—James Bruce.

SHORTHAND—F. W. Jonson, F.I.P.S.

DRESSMAKING—Mrs. Sinfield, at Council Chambers, Town Hall, Liverpool-road.

BALMAIN TECHNICAL SCHOOL.

288 Darling-street, Balmain.

FREEHAND DRAWING, MODEL DRAWING, GEOMETRICAL DRAWING, PERSPECTIVE—*Teacher*, R. M. Ronald.

MECHANICAL DRAWING—*Teacher*, J. Elder.

ARCHITECTURAL DRAWING—As arranged.

DRESSMAKING—*Teacher*, Mrs. Sinfield.

BOOK-KEEPING—*Teacher*, F. Bender.

SHORTHAND—*Teacher*, G. H. Hexter, F.I.P.S.

EASTERN SUBURBS TECHNICAL SCHOOL.

Evening Art Classes meet at the Public School, Waverley; Day Art Classes meet at 166, Queen-street, Woollahra; Dressmaking Class at Methodist School Hall, Bondi Junction.

ART TEACHERS—Alfred Coffey, Miss Mary E. Geiger.

FREEHAND DRAWING, MODEL DRAWING, PLANT DRAWING, GEOMETRICAL DRAWING, PERSPECTIVE, DESIGN,

BLACK AND WHITE (Pen and Ink and Wash), ANTIQUE DRAWING,

DRESSMAKING—Miss Dorothy Bradley.

TECHNICAL EDUCATION.

NORTH SYDNEY TECHNICAL SCHOOL.

Classes meet at the Superior Public School, Blue-street, and School of Arts, Mount-street.

FREEHAND DRAWING FROM THE CAST (in pencil, chalk, and monochrome painting); MODEL AND OBJECT DRAWING; PLANT DRAWING; BLACK AND WHITE (Pen and Ink and Wash Drawing); DESIGN AND ILLUMINATION; PLANE AND SOLID GEOMETRY; PERSPECTIVE AND MECHANICAL DRAWING; BRUSH-WORK; ANTIQUE; SKETCHING FROM NATURE IN CRAYON, OIL, AND WATER-COLOUR PAINTING—*Teacher*, G. A. Thomas.

ARCHITECTURAL DRAWING, BUILDING CONSTRUCTION, TRADES DRAWING—G. A. Roberts, A.T.C., Syd., A.I.A., N.S.W.

SHORTHAND—Wm. Stuart. BOOK-KEEPING—A. Armstrong. GERMAN—Herr Oschatz.

RYDE TECHNICAL SCHOOL.

Classes meet at Public School, Ryde; also School of Arts, North Ryde.

ART TEACHER—Miss Mary T. Collingridge.

RYDE.

FREEHAND DRAWING, MODEL DRAWING.

NORTH RYDE.

FREEHAND DRAWING, MODEL DRAWING.

NEWTOWN TECHNICAL SCHOOL.

Classes meet at the Superior Public School, King-street, Newtown.

FREEHAND AND PERSPECTIVE DRAWING; MODEL, PLANE, AND SOLID GEOMETRICAL DRAWING—*Teacher*, A. G. Reid.

SURREY HILLS TECHNICAL SCHOOL.

Classes meet at the Superior Public School, Crown-street.

BOOK-KEEPING—*Teacher*, A. Armstrong.

KOGARAH TECHNICAL SCHOOL.

Classes meet at the Public School.

DRESSMAKING—Miss F. I. Wilson.

FREEHAND AND PERSPECTIVE DRAWING—*Art Teacher*, R. Norman Anderson.

WOOLLAHRA TECHNICAL SCHOOL.

Classes meet at 43, Edgecliff-road, Woollahra.

SHORTHAND—*Teacher*, Colin Christie.

DOUBLE BAY TECHNICAL SCHOOL.

Classes meet at St. Mark's School Hall, New South Head Road, Paddington.

FREEHAND AND MODEL DRAWING AND DESIGN—*Teacher*, E. M. Smith.

MANLY TECHNICAL SCHOOL.

Classes meet at the Public School, Manly.

FREEHAND AND MODEL DRAWING.—F. W. Hughes.

ERSKINEVILLE TECHNICAL SCHOOL.

TECHNICAL BOOT-MAKING SCHOOL (near Railway Station)—H. Lewis, *Teacher*—Pattern-cutting and Clicking; other Classes will be formed if sufficient students apply.

DRESSMAKING—Miss Blake.

SADDLERY AND HARNESS MAKING—F. J. Andrew.

WAVERLEY TECHNICAL SCHOOL.

Class meets at Public School. *Art Teacher*—A. R. Coffey.

FREEHAND, MODEL, GEOMETRICAL, PERSPECTIVE, PLANT, DESIGN, AND BLACK AND WHITE DRAWING.

DRESSMAKING (Classes meet at the Methodist School Hall)—Miss D. Bradley.

Hurlstone Agricultural Continuation School.

Established 1907.

(By F. McMULLEN, M.A., Principal of College.)

STAFF.

<i>Principal ...</i>	...	...	...	...	F. McMULLEN, M.A.
<i>Science Master ...</i>	...	...	...	...	W. L. HAMMOND, B.Sc.
<i>Field Foreman and Instructor in Agriculture...</i>	...	...	...	...	J. W. HADFIELD (Hawkesbury College Diploma).
<i>Instructor in Farm Carpentry ...</i>	...	...	...	...	L. P. G. PINN.
<i>Assistant Master (English Section) ...</i>	...	...	...	...	C. TONKING.
<i>Instructors of Drill and Gymnastics ...</i>	...	...	...	...	LIEUT.-COL. PAUL, V.D., and STAFF.
<i>Instructor in Blacksmithing ...</i>	...	...	...	...	P. GRIFFITHS.
<i>Instructor in Plumbing ...</i>	...	...	...	...	W. E. PATINO.
<i>Caretaker...</i>	...	...	...	...	G. BAKER.



STAFF OF HURLSTONE COLLEGE.

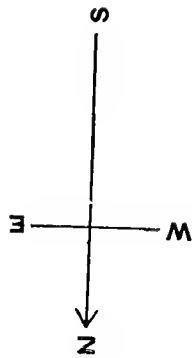
Reading from left to right—

Front row: Mr. Pinn, Instructor of Carpentry; Mr. Hammond, Science Master;
Mr. McMullen, Principal; Mr. Hadfield, Instructor in Agriculture.

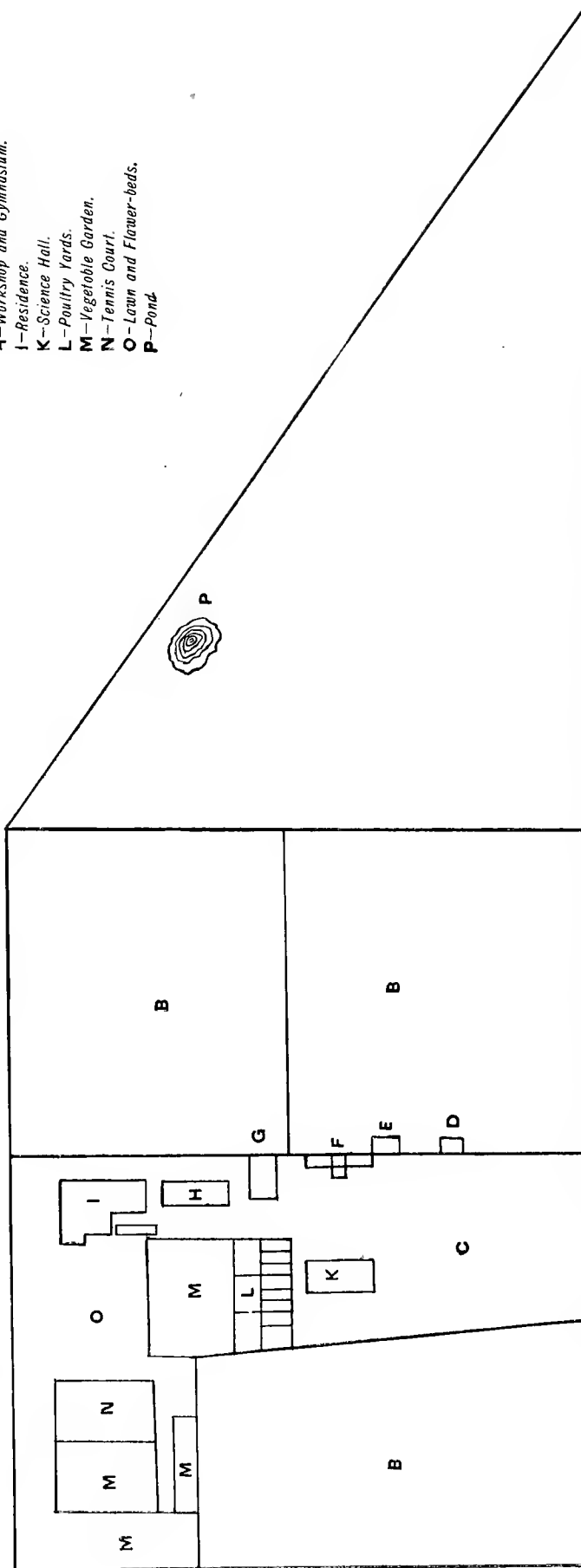
Back row: Mr. Liggins, Drill Instructor; Mr. Patino, Instructor in Plumbing;
Mr. Tonking, Assistant Master (English).

AIMS OF THE INSTITUTION.

WHEN in 1906 the Department of Public Instruction determined to close the Women's Training College at Hurlstone, and extend the principle of co-education to the training of teachers, it had left on its hands the fine estate of Hurlstone, embracing nearly 27 acres, with buildings and class-rooms. The question naturally arose how to utilise such a place. Mr. J. W. Turner, the Superintendent of Technical Education, immediately came forward with a scheme for the establishment of a Continuation School based on agricultural lines. As a result, the Hurlstone School began operations on April, 1907. In advocating the necessity for such a school Mr. Turner pointed out that the tendency of our present-day education was to be entirely academic or literary in character. It did not supply that demand for industrial intelligence which fits a child to fulfil his function in life as a producer. Continuation Schools are designed to supply this deficiency by providing an education which will result in increased industrial efficiency.



- A - Grazing Paddock, 10 acres.
- B - Cultivation Plots, 12 acres.
- C - Playing Field, 2½ acres.
- D - Hayshed.
- E - Dairy.
- F - Sheds.
- G - Caretaker's Cottage.
- H - Workshop and Gymnasium.
- I - Residence.
- K - Science Hall.
- L - Poultry Yards.
- M - Vegetable Garden.
- N - Tennis Court.
- O - Lawn and Flower-beds.
- P - Pond



HURLSTONE AGRICULTURAL CONTINUATION SCHOOL-GROUND PLAN.

It has long been felt that the future of Australia is closely bound up with the development of her agricultural resources. One of the needs of the day, then, is for intelligent, well-trained agriculturists. The time is rapidly approaching when it will be recognised that there is scarcely any occupation which calls for so thorough a training as does agriculture. The farmer of the new age is to be a man of wide and general knowledge. Science, business knowledge, and an acquaintance with the world's markets are necessary parts of his equipment. It is to help towards the attainment of these ideals that the Hurlstone Agricultural Continuation School has been established.

In drawing up the scheme of instruction for the school two main objects have been kept in view. In the first place it was decided that the instruction should be very largely of a practical character—"learning by doing." But side by side with this, technical education is carried on the general education of the boys. The State has a right to expect from every



ONE OF THE FEATURES OF PRACTICAL WORK.

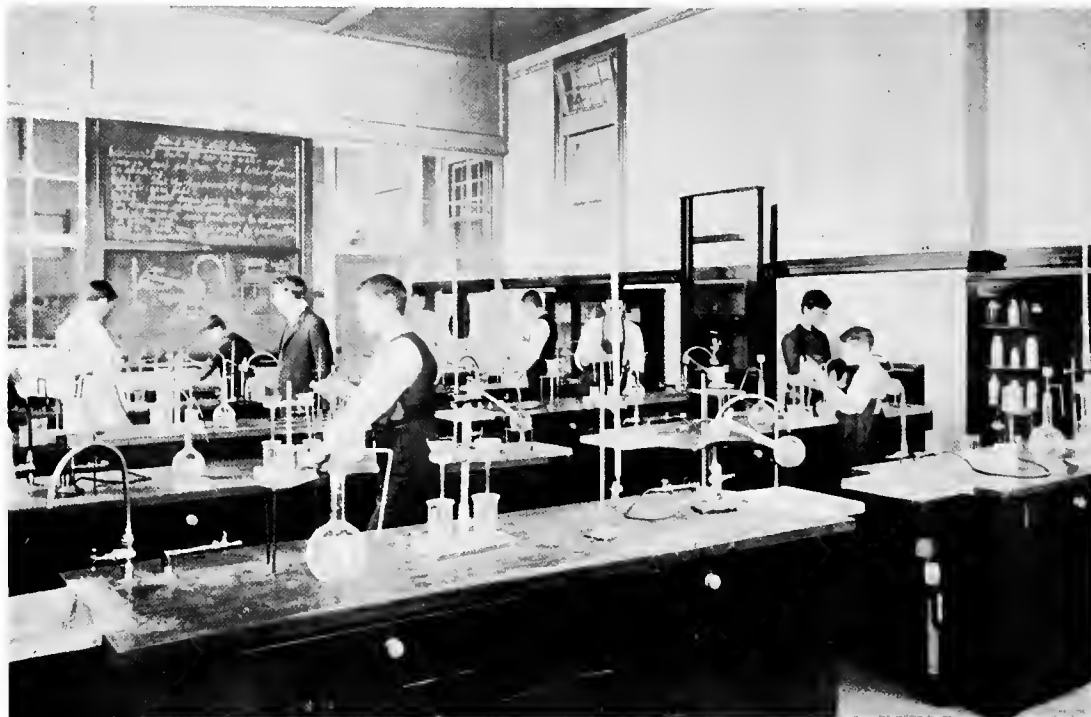
system of education—technical and otherwise—that the cultural side should not be neglected, but that those who are to be the future citizens should be educated not merely to earn their livings, but so as to be fitted for the weighty responsibilities of citizenship.

CHARACTER OF THE INSTRUCTION.

The endeavour to satisfy these claims explains the threefold division in the course of instruction at this school.

- (1) The English Section, comprising English Language and Literature, History, Geography, and Mathematics.
- (2) The Science Section, comprising Chemistry, Physics, Geology, Botany, and Zoology.
- (3) The Practical Section, comprising Farm and Garden work, Dairying, Orcharding, Farm Carpentry, Blacksmithing and Plumbing.

Of the English Section little need be said. While due regard is paid to the cultural value of the subjects of instruction, they are at the same time correlated with the practical operations in farm life. For example, the mathematical course includes calculation of areas; quantity measurements as applied to tanks, dams, haystacks, levelling, and similar operations.



CHEMICAL AND PHYSICAL LABORATORY.

The Science work is taught experimentally. Its great object is to develop the scientific mind and attitude. Every up-to-date farmer must use the teachings of Science, and must be able to put questions to nature in the form of experiments. For this the scientific training is essential.

The special features of the Science Course are as follows:—

In Chemistry particular attention is paid to such elements as are directly concerned with agriculture. Thus we find included in the course a study of the chemistry of plant life and soils; analysis of fertilizers, and of milk for fats and solids.

The Botany course includes the study of rusts, smuts, and mildews; the principal grasses and fodder crops; and noxious weeds and their eradication.

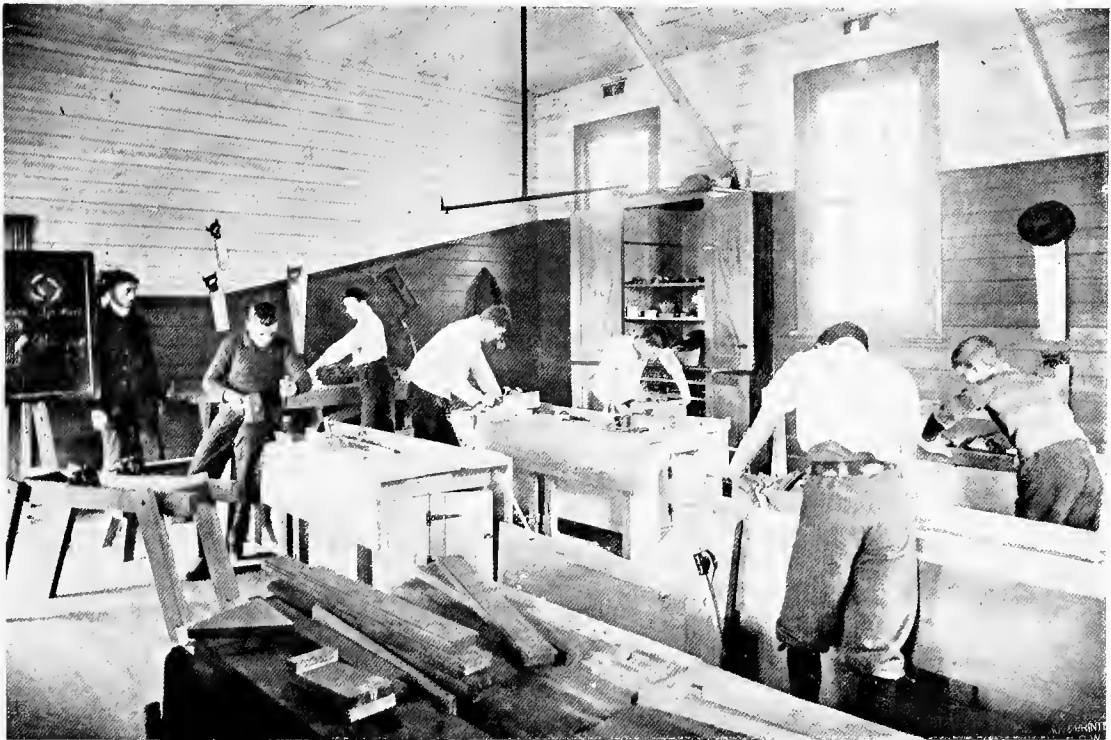
Prominence is given in the Zoology course to noxious and beneficial insects, which are studied from life and from dried specimens.

The Practical course, besides giving the boys a working knowledge of ordinary farming operations, aims at making them ready to cope with the manifold emergencies of farm life; hence the inclusion in this course of carpentry, blacksmithing and plumbing.

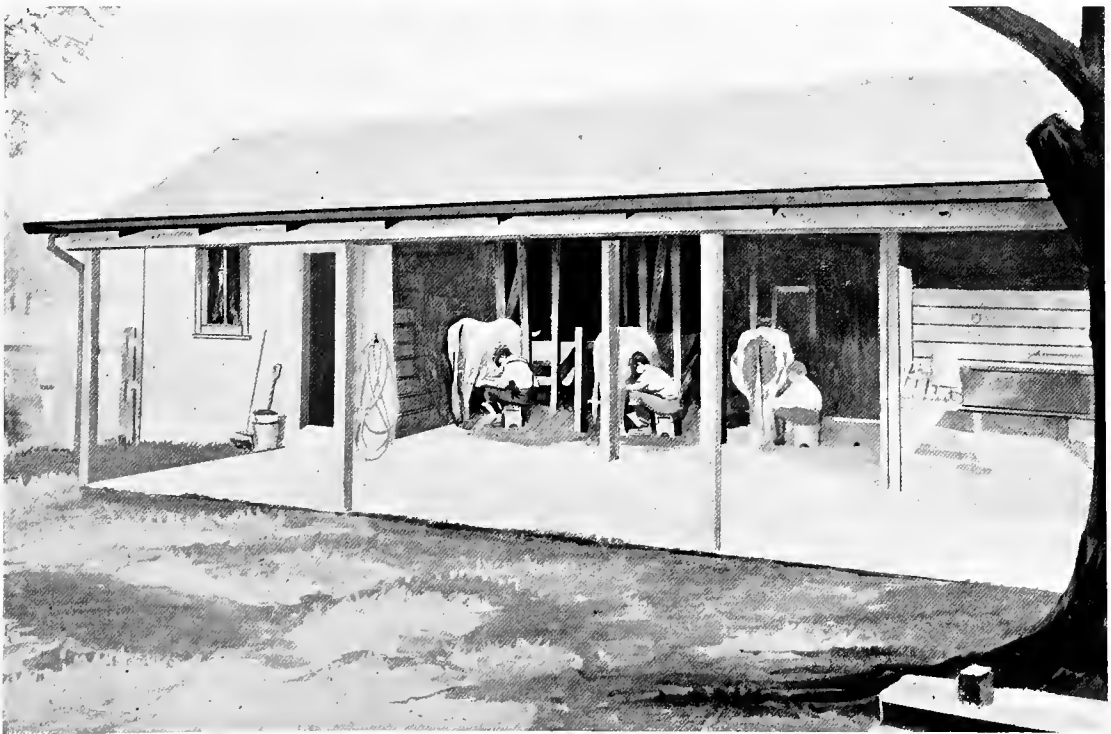
Students are taught the use of the plough, harrow, cultivator, seed-drill, and other farm implements, and in addition are trained to care for and repair these implements.

The practical operations are combined with theoretical instruction in the principles underlying them.

The Carpentry course differs somewhat from the ordinary manual training course, in that it specially aims at teaching work applicable to the farm. Thus we find the students making milking stools, farm gates, swingle-bars, wheelbarrows, building fences and sheds, and carrying out general repairs. The workshop is fitted with carpenter's benches and is well supplied with all necessary tools.



MANUAL TRAINING WORKSHOP.



THE DAIRY

The blacksmith's shop is equipped with anvils, forges, and all the simple tools required for the work. Here, again, the instruction is designed to meet the needs of the man on the land. It includes the drawing, bending, and welding of iron and steel; making links and repairing chains; and the repairing of farm tools.

That the former may be a veritable handyman, a plumbing section is added wherein the boys are taught soldering, riveting, repairing milk cans and buckets, screwing and jointing of pipes for water and steam supply; and the fitting up and keeping in repair of pumps.

Dairying occupies a prominent place in the school course. Full instruction is given in milking, feeding, and food values, the running and care of separators, and the testing of milk and cream. The dairy is equipped with a separator, Babcock tester, milk cooler, and other accessories of a modern dairy. The floors are cemented and sloping, and students are taught the paramount importance of cleanliness and attention to sanitation.



THE RESIDENCE—FRONT VIEW.

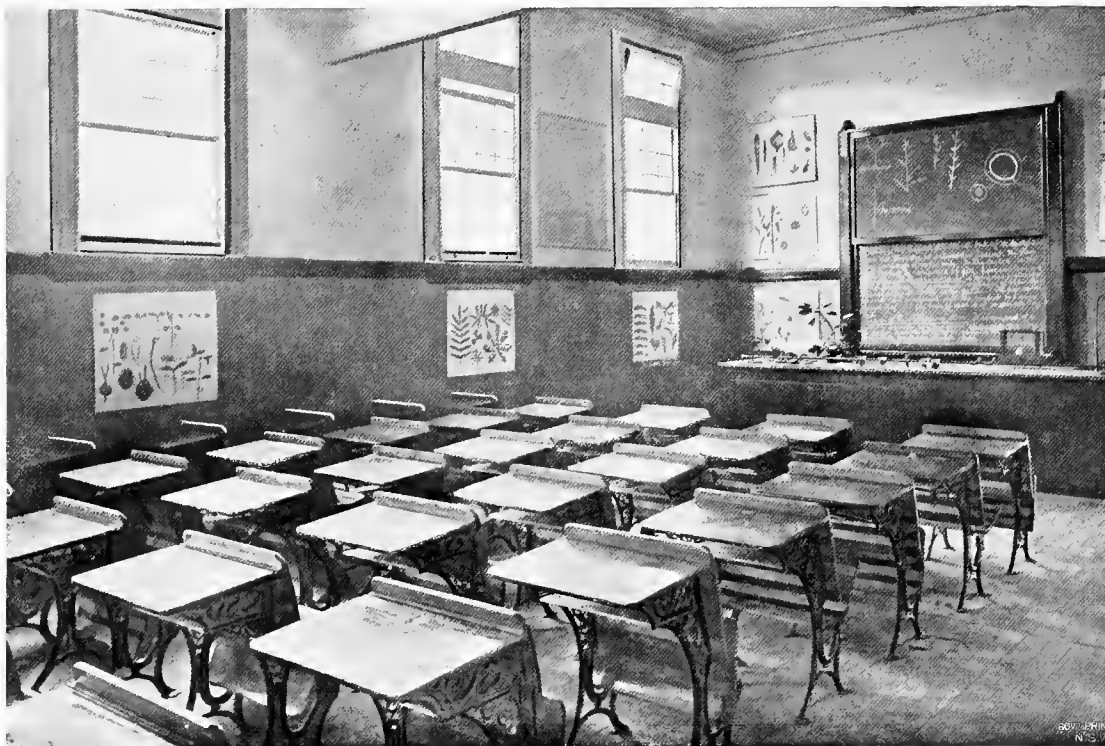
BUILDINGS AND CLASS-ROOMS.

The buildings consist of the Principal's residence, with students' dormitories and dining-room, the English Class Room, Reading Room, and domestic quarters attached. The advantage of this arrangement is that the Principal is able at all times to maintain a personal supervision of the students. Other buildings are the Science Hall, containing a Lecture-room and Laboratory, Dairy, Manual Training workshop, Plumbing workshop, Smithy, toolsheds, hay-shed and necessary outbuildings.

The Science Hall is a fine detached brick building, divided into Lecture-room and Laboratory. These are separated by a glass partition. Each room is 38 ft. x 24 ft., and is splendidly lighted and ventilated. The Lecture-room is provided with forty single desks and a fine demonstration bench. In the Laboratory are ten benches, each accommodating two students. They are fitted with cupboards for storing students' materials. The arrangements for supplying gas and water are complete. The Laboratory is well supplied with all the apparatus for conducting chemical and physical investigation. Microscopes, balances, &c., of a good type are provided.



SCIENCE HALL—EXTERIOR VIEW.



SCIENCE HALL—INTERIOR.

The Dining Hall has accommodation for fifty students, and the dormitories provide for thirty-eight. The dormitories are divided into cubicles so that each boy may secure a certain degree of privacy, while complete supervision is still possible.

The Reading Room is supplied with daily and weekly papers, magazines, and the principal agricultural journals of the State. There is a small but carefully chosen library containing books on agricultural and general literature.

FARM GROUNDS.

The School is situated in Ashfield, about 1 mile from Summer Hill station. The site is elevated and commands a fine view of the surrounding suburbs. The total area is 26 acres 3 roods. About 10 acres are used for grazing purposes, while 12 acres are under cultivation.



THE VEGETABLE GARDEN.

During last year the principal crops raised were, wheat (6 varieties), maize (6 varieties), oats, barley, sorghum, potatoes (2 varieties), sweet potatoes, pumpkins, squashes, melons, and all the usual vegetables. There is a small orchard newly planted, and about 120 grape vines. Small experimental plots are being laid out and specimen plots of various commercial crops are being grown. The playing fields are $2\frac{1}{2}$ acres in extent, and the boys are encouraged to play cricket, football, and tennis. The remainder of the ground is occupied by buildings, flower beds, and lawns. The whole estate is fenced and subdivided.

STUDENTS.

When the school opened in April, 1907, there were but seven students in attendance. By the end of the year this number had increased to twenty-three. In 1908 the attendance reached fifty-five, and the accommodation for resident students was taxed to the utmost. For the current year the enrolment is fifty-six, of whom thirty-eight are resident students.

At this early stage of its career little can be said of the achievements of the students, as only eight have completed the full course. Of these three have gone to the Hawkesbury College to take advantage of the more advanced course provided by that institution, while another is continuing his agricultural education by studying wool-classing at the Technical College. The others have taken positions on farms where their services have been eagerly sought.



CORNER OF STUDENTS' DINING HALL.

In December, 1907, one of the students was successful in winning the first "Mail Scholarship" to Hawkesbury College, while last year another student was chosen out of a number of applicants for the position of Scientific Cadet in the Entomological Branch of the Department of Agriculture. The attitude of the students towards their work is extremely satisfactory, the keenest interest being shown in all practical operations and in experimental science, while outdoor work and healthy surroundings contribute to robust health. The physical development is further provided for by cricket, football, tennis, gymnastics, and military drill.

Bathurst Technical College.

(By T. C. DWYER, B.Sc., Resident Master in charge.)

TECHNICAL Classes were first formed in Bathurst by Dr. W. F. Bassett (Senr.), some thirty years ago.



STAFF OF BATHURST TECHNICAL COLLEGE,

Reading from left to right—

Front Row: Mr. Coles, Carpentry, &c.; Miss Collingridge, Art; Mr. Dwyer, Resident Science Master-in-charge; Miss Rowell, Cookery; Miss Clapham, Dressmaking.

Back Row: Mr. Ollier, Caretaker; Mr. Copeman, Geometry, Mechanical Drawing, &c.; Mr. Macartney, wool-classing; Mr. Giddey, Plumbing; Mr. Dryden, Shorthand.

In Front: Mr. Randell, Laboratory Assistant.

Under Dr. Bassett's charge the classes grew so rapidly that in a few years a Resident Master was required: Mr. W. J. Clunies-Ross, B.Sc. (Lond.), being selected for the position.

In 1904 Mr. Ross proceeded to Sydney as Lecturer in charge of the Department of Chemistry, after a service of twenty-two years in Bathurst, and the present College, whose foundation stone was laid in 1896 by Mr. J. Garrard, then Minister for Education, stands today a monument to the zeal, enterprise, and energy of that gentleman and Dr. Bassett.

Mr. Ross was succeeded by Mr. Donald Locke, E.M. (Freiburg), who in turn was succeeded in 1906 by the present Resident Master.

The building is situated in William-street, Bathurst, and the style of architecture adopted in its erection is similar to that of Central Technical College, Sydney. There are two main

floors. On the ground floor are situated Museum, Geological and Chemical Laboratories, Cookery Department, Plumbers' Workshop. On the First floor are the Commercial, the Physics, the Dressmaking, the Carpentry, and the Wool-classing rooms, Lecture Hall (72 ft. x 30 ft.) and Caretaker's quarters.



EXTERIOR VIEW OF TECHNICAL COLLEGE AT BATHURST.

The Lecture Hall is provided with lantern and sheet for illustrating lectures, and has accommodation for 300 people. The Museum is well filled with specimens of general and economic interest from the surrounding districts, *e.g.*, wool specimens, ores, timbers, building stones, and in addition are displayed works of art loaned by the trustees of the National Art Gallery. Gas and water are laid on throughout the building, and the students' convenience is in every way studied.

Among the students who entirely, or in part, owe their progress to tuition received at this College, may be mentioned the following:—

Messrs. R. W. Peacock, Manager of Government Experimental Farm, Bathurst; W. E. George, Chemist, Bathurst; C. Newman, Chemist, Sydney; J. J. Copeman, F.I.A., Architect, Bathurst; J. H. Bates, Architect, Forbes; W. H. Sadler, Architect, Junee; J. Sykes, Architect, Casino; A. Humphries, Engineering Draftsman and Teacher Mechanical Drawing, Railway Institute, Bathurst; Mackenzie Bros. (2), Engineers, Sydney; C. Toovey, Engineer, Hobart; Hamilton Bros. (3), Engineers, Sydney; P. Beddie, Contractor, Milthorpe; F. R. Jones, Contractor, Bathurst; Walter Tinsley, Plumber, Bathurst; Miss M. Clapham, Dressmaking and present teacher at College; Miss Giddey, Teacher of Dressmaking, Casino.

COMMERCIAL SECTION.—The class-room, which is 24 ft. x 19 ft., is provided with the necessary accommodation for twenty-five students.

Classes are held in Book-keeping by F. J. Tonkin, Esq., Shorthand by W. Dryden, Esq., Mathematics by Science Master.

BOOK-KEEPING.—The nature of the work done, as shown in the Syllabus issued by Central Technical College, aims at giving students a good general knowledge of the subject in its various branches, *e.g.*, Principles and advantages of Double Entry *v.* incompleteness of Single Entry, and where required, a detailed knowledge of some particular branch of the subject.

The class is attended by (i) boys and girls leaving school wishing to prepare for commercial life; (ii) shop-assistants; (iii) station hands; (iv) apprentices to various trades; (v) clerks desirous of improving their knowledge of the subject.

SHORTHAND.—Pitman's method is adopted in teaching this subject, and students are drawn from practically the same sources as those of book-keeping class, chiefly, however, from clerks from warehouses, law offices, and factories, and from youths desirous of entering journalistic life.

MATHEMATICS.—Arithmetic: According to the Syllabus each student is required to have a knowledge of the subject as far as decimals before entering the class, but in many cases it has been found necessary to allow the student to commence on the "first four rules," he never having had any tuition in the subject, or leaving school at an early age, has forgotten even what he then learned. For students such as these, and there are many, the regular course is quite impossible, and in these cases the lecturer is content to see that his pupil acquires a thorough knowledge of Weights and Measures, Simple Proportion, and if possible, Profit and Loss, and Simple Interest. With properly qualified students the course is followed in detail, generally with beneficial results. The class is attended by youths just left school, clerks, labourers, shop-assistants, teachers, carters, farm hands, &c.

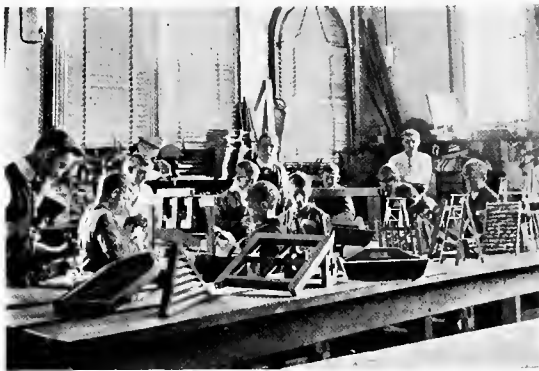
GEOMETRY, ALGEBRA, and TRIGONOMETRY is attended by fewer students, chiefly teachers and apprentices to trades.

RESUMÉ.—As will be seen from the varied occupations of the students attending, the classes are patronised by a large section of the community. The College acts as a Continuation Commercial School for Bathurst and the surrounding districts, and many local employees owe their business advancement to the facilities it offers for a preparatory training in commercial life.

CARPENTRY, TURNING, AND CARVING.

(Teacher, F. COLES.)

The room, 31 ft. x 22 ft., is rather small, but well equipped, being supplied with, (1) double benches fitted with bench stops, vice, tool-rack, and a few of the most commonly



CARPENTRY WORKSHOP.

used tools for each bench; (2) turning lathe; (3) carving benches and stools; (4) complete set of tools for teacher; (5) accessories, such as samples of woods, models of courses, grindstones, blackboard, &c.

The classes aim at improving the efficiency of the apprentice and have built up such a local reputation that one leading contractor has asserted repeatedly, both privately and publicly, that he would keep no apprentice who neglected to attend these classes during his apprenticeship.

In addition, the Carpentry and Turning Classes are attended by persons of varied occupations who desire to learn the use of tools, &c., *e.g.*, farmers, clerks, teachers, labourers, shop-assistants. Carv-

ing students find carpentry a necessary adjunct in constructing articles of furniture from their carved woodwork.

CARVING, regarded rather as belonging to the Art section than a trade class, is nevertheless attended well by apprentices. The main bulk of students in this class comes from ladies engaged in home duties, who make use of the accomplishment for decorative purposes.

MANUAL TRAINING.—Attended by Public School pupils; Course modelled on Slade's system. Pupils required to complete a certain set of exercises in woodwork, and are instructed in use and care of tools; in growth, colour, hardness, grain, cutting, and seasoning of timber.

On completion of the set exercises it has been found most advantageous to allow the boys to construct small articles for home use, *e.g.*, chair, table, knifebox, easel, &c.

DOMESTIC SCIENCE, COOKERY, AND LAUNDRY.

(Teacher, MISS M. ROWELL.)

This department has a kitchen (25 ft. x 18 ft.), dining-room (21 ft. x 10 ft.), scullery, and pantry.

The courses as laid down in the Syllabus are followed, while the rooms are well equipped with all utensils necessary for the work. Two gas stoves supply the heat required; while there is table accommodation for twelve students in a class.

Cleanliness, use of weighed quantities of material, necessity for proper cooking and serving of all foods, are among the objects aimed at in the teaching of Cookery.

Attended chiefly by ladies engaged in home duties, also by a few students desirous of becoming teachers in the subject; the latter class being also in attendance at lectures in Domestic Science, and laundry work.



COOKERY KITCHEN.

DRESSMAKING.

(Teacher, MISS M. CLAPHAM.)

The workroom is 24 ft. x 19 ft., and well lighted. It is supplied with the necessary drafting tables, clothes presses, sewing machines, and facilities for ironing.

This class is found to be of great benefit to persons learning the subject which they intend to adopt later as a means of livelihood, and to those learning for home use only. The students are drawn from the surrounding district, and as far west as Blayney.

DRAWING AND PAINTING.

FREEHAND, MODEL, AND ANTIQUE DRAWING, OIL, AND WATER-COLOUR PAINTING.

(Teacher, MISS A. COLLINGRIDGE.)



DRAWING AND PAINTING.

These classes were formed and conducted for many years by the late Mr. Arthur Collingridge, Vice-President of the Royal Art Society, and his influence on Art in the district is still most marked. Since his death the work has been ably carried on by his daughter, the present teacher. The classes are attended by school pupils, teachers, clerks, printers, painters, apprentices, &c.

TECHNICAL EDUCATION.

GEOMETRICAL, PERSPECTIVE, AND MECHANICAL DRAWING.

(Teacher, J. J. COPEMAN, F.I.A.)

The classes are attended by apprentices to various trades, labourers, carriage-builders, teachers, mill employees, painters. Students attending the Plumbing and the Carpentry classes also form the majority of pupils; the advantages that the ability to understand plans and elevations of structures confers on workmen, are obvious.

The present teacher is the leading Architect of the district, and has been connected with these classes for twenty years, first as student (four years) and then teacher (sixteen years).

PLUMBING.

(Teacher, L. GIDDEY.)

The four-years course, as laid down by Syllabus, is given, the students being apprentices from Railway Workshops and those already in the trade who are desirous of improving their knowledge of the subject, and of becoming proficient in the theoretical side as well as the practical. The excellent quality of the work turned out is shown by the fact that the class has won outright the Stewart Dawson & Co. Silver Cup, which was offered as a prize for "Best Trades Display" in local Eight-hour Day celebration, with a record of three First Prizes, and one Second in four years.

SCIENCE.

(Lecturer, T. C. DWYER, B.Sc.)

Classes are held in Geology, Chemistry, Botany, Zoology.

CHEMISTRY.—The laboratory is on the ground-floor and has bench accommodation for fourteen students. Its dimensions are 27 ft. x 17 ft., and it is provided with draught cupboard, ovens, water baths, foot blow-pipes, balances and cupboards for chemicals, muffle furnaces for assaying. The classes follow the course of instruction for practical work laid down in Syllabus, and lectures in theoretical chemistry (Organic and Inorganic) are given in the Science lecture room. The students are chiefly Public School teachers, apprentices, gasworks employees, surveyors' assistants.

A special course in Agricultural Chemistry has been arranged for students from the local Experimental Farm, in order to enable them to understand the various chemical principles embodied in the subject, and the methods adopted for simple analysis of soils, water, manures, crops, spraying mixtures, &c.

GEOLOGY.—There is accommodation in the lecture and demonstration room for sixteen students. The room is 24 ft. x 19 ft., well lighted, and supplied with an excellent collection of rocks, minerals, and fossils, also petrological microscope and slides.

The class is attended chiefly by Public School teachers, other students comprise surveyors' assistants, apprentices, and school pupils studying for public examinations.

BOTANY AND ZOOLOGY.—These classes are provided with the necessary microscopes, slides, botanical and zoological specimens, and are attended by Public School teachers and school pupils for the purposes of Nature Study.

Elementary courses in Chemistry, Geology, Physics, and Botany are given to probationary students and senior pupils of the local district school.

WOOL-CLASSING.

(Teacher, H. H. MACARTNEY.)

The class has been in operation only during the last twelve months and has been well attended. The object of the class is to give persons engaged in woolgrowing solely, or in mixed farming, a good working knowledge of wool. It is not expected that any will be expert wool-classers from this tuition alone, but such a knowledge will be of immense value to the mixed farmer on a small holding where *any* attempt to "class" his small clip will mean better prices

than at present when the wool has to be baled and sold without classing. The formation of the class in the first place was largely due to Rev. J. J. O'Reilly, President of St. Stanislaus College, who sent a large number of students from that institution, insisting that a knowledge of Agriculture rather than Classics is necessary for boys leaving school to go "on the land." Mr. R. W. Peacock, Manager of Bathurst Experimental Farm, is also a hearty supporter of the class, and the "farm" students numbering twenty-five attend for instruction. In addition, the class is attended by farmers, labourers, clerks, &c., from the surrounding district. The class, in charge of the instructor, visits some famous sheep stations of the district during shearing time, *e.g.*, "Hereford," (J. J. Rutherford, Esq.) "Killongbutta," (Anderson Bros.) and for study in sheep-breeding, the "Hathrop" stud has been kindly placed at the class's convenience by W. H. Webb, Esq.



THE WOOL-CLASSING ROOM.

PROGRAMME OF CLASSES.

BATHURST TECHNICAL COLLEGE.

(Classes meet at the Technical College, William-street.)

Resident Science Master in Charge : T. C. DWYER, B.Sc. (Sydney).

AGRICULTURAL CHEMISTRY, PHYSICS, GEOLOGY, MINERALOGY, BOTANY, CHEMISTRY, ASSAYING.

MATHEMATICS—Arithmetic, Algebra, Geometry, Mensuration, Trigonometry.

BOOK-KEEPING—F. J. Tonkin.

FREEHAND DRAWING, MODEL DRAWING, ANTIQUE DRAWING, OIL PAINTING—Miss Collingridge.

SHORTHAND—W. Dryden.

DRESSMAKING—Miss Clapham.

CARPENTRY, WOOD-TURNING, MANUAL TRAINING, WOOD-CARVING—F. Coles.

PLUMBING AND METAL PLATE WORKING—L. Giddey.

COOKERY—*Plain* (Theory and Demonstration), *Advanced* (Theory and Demonstration), *Junior* DOMESTIC SCIENCE; LAUNDRY—Miss Rowell.

WOOL-CLASSING—H. H. Macartney.

GEOMETRY, PERSPECTIVE AND MECHANICAL DRAWING—J. J. Copeman, F.I.A.

Broken Hill Technical College.

(By JAMES FORDE, B.A., B.Sc., Resident Science Master in Charge.)

The principal classes conducted at this College are attended by students engaged in the various metalliferous mines of the Barrier, with a view to their advancement in their respective trades



RESIDENT MASTER AND STAFF OF BROKEN HILL COLLEGE.

or professions. Such are the courses in Chemistry (Inorganic and Organic), Assaying, Metallurgy, Mineralogy, Mining, Geology, Mine-surveying, Mathematics, Mechanical Drawing, and Machine design, Electric Motor-driving and Steam-engine Practice, Fitting and Turning, Carpentry and Joinery. In a word, the various courses of instruction provided are such as meet the needs of students in a Mining field, where the extraction of the metals (principally lead, silver, and zinc) involves highly specialised scientific knowledge. The Chemical

and Assay Laboratories are, as befits such a locality, especially commodious, well-designed, and well-equipped. Bench accommodation is provided for sixty students.

Special rooms are equipped for gas and water analysis.

The completion of an up-to-date fitting and turning workshop affords an opportunity for apprentices engaged on the mines (most of whom have already completed courses of Mechanical Drawing and Machine Design at the College) to gain a wider and fuller training than they would in the more limited and special work which constitutes their daily tasks in the engineering workshops of the mines.

The work of the College in scientific instruction is supported and furthered by the enlightened policy of the mine managers in requiring the junior officers of the assay and metallurgical staffs, &c., to attend these courses, and in recognising the certificates gained by them at the College, when considering their claims for promotion. This policy has been of marked mutual benefit.

The position of the College is thus almost unique in the facilities it offers, in conjunction with the mines, for a combination of theoretical and practical instruction in the various subjects embraced in a Mining Engineering course. Students are, furthermore, in such an environment, encouraged to work by a clear view of the direct and



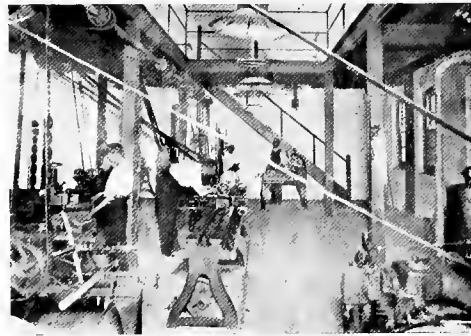
EXTERIOR OF COLLEGE.

practical outcome of their studies. Several young men thus trained have already, after gaining their associateships, secured responsible positions on the metallurgical staffs of the mines.

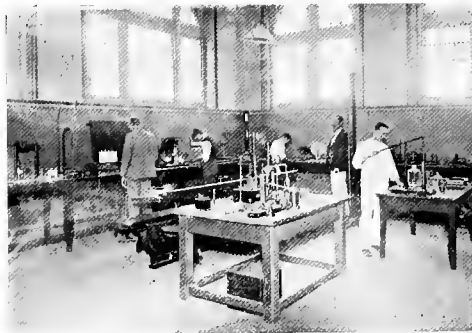
The College Library contains the principal scientific and technical works of reference and text-books used in connection with the courses enumerated above, and the chief scientific periodicals are supplied.



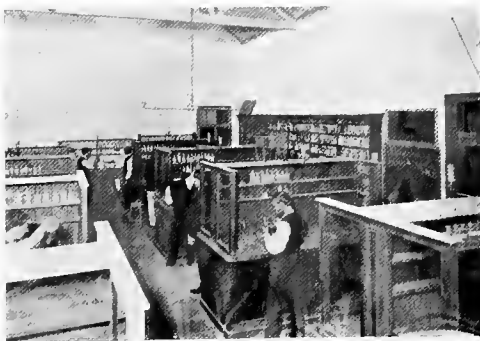
THE CARPENTRY WORKSHOP



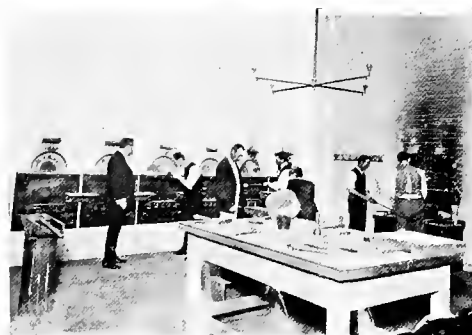
THE ENGINEERING WORKSHOP



THE PHYSICS LABORATORY.



THE CHEMICAL LABORATORY.



THE ASSAY FURNACES.

Besides these special classes, provision is made for instruction in Art, in Commercial Subjects, and in Domestic Science. These classes are all well attended.

PROGRAMME OF CLASSES.

BROKEN HILL TECHNICAL COLLEGE.

Resident Science Master in Charge—JAMES FORDE, B.A., B.Sc. *Assistant*—E. CLARENCE WOOD, M.A., B.Sc., B.E.

DEPARTMENT OF CHEMISTRY—THEORETICAL CHEMISTRY.—Non-Metals; Metals; Organic Chemistry.

PRACTICAL CHEMISTRY.—1st Year: Elementary Qualitative Analysis of Simple Salts and Mixtures; 2nd Year: Qualitative Analysis of Complex Mixtures, Minerals, Alloys, &c.; Quantitative Analysis, Organic Chemistry.

DEPARTMENT OF METALLURGY—ASSAYING.—The Assay of Ores, Bullion, Metallurgical Products, by Dry and Wet Processes. METALLURGY.

DEPARTMENT OF GEOLOGY, MINERALOGY, AND MINING.—GEOLOGY. MINERALOGY. MINING—B. Sawyer, B.E. (Government Inspector of Mines). MINE-SURVEYING. PHYSICS. MATHEMATICS—Technical Arithmetic, Trigonometry, Algebra, Geometry—R. C. Edwards, B.Sc. MECHANICAL DRAWING AND MACHINE DESIGN—J. Haycraft, A.S.A.S.M.

MOTOR-DRIVING.—E. C. Wood.

FREEHAND DRAWING, GEOMETRICAL DRAWING, MODEL DRAWING, PERSPECTIVE DRAWING—C. G. Walker.

SHORTHAND, BOOK-KEEPING, PENMANSHIP, TYPEWRITING—W. Thomson, F.I.A.

CARPENTRY AND JOINERY—T. Eaton.

DRESSMAKING—Miss Rogers.

DOMESTIC SCIENCE—Cookery (Plain and Advanced) and Laundry Work—Miss C. H. Dutton.

FITTING AND TURNING—W. J. Daniels.

Granville Technical School.

(By JAMES B. BROWN, Resident Master in Charge).

A CLASS for instruction in Geometrical Drawing was opened in the School of Arts, Granville, on Thursday evening, 30th October, 1884.

This class was recognised as a duly constituted class by the Board of Technical Education, and the teacher appointed to give instruction in Geometrical and Mechanical Drawing on the 15th January, 1885. Since that date classes have been carried on without cessation at this centre, which from its geographical position, admirably suits the convenience of students in the district between Croydon and Hornsby and Campbelltown, Penrith and Richmond. The classes have steadily grown in public favour and increased in number until the two subjects in which instruction was originally given have increased to twenty-three, taught by a staff of

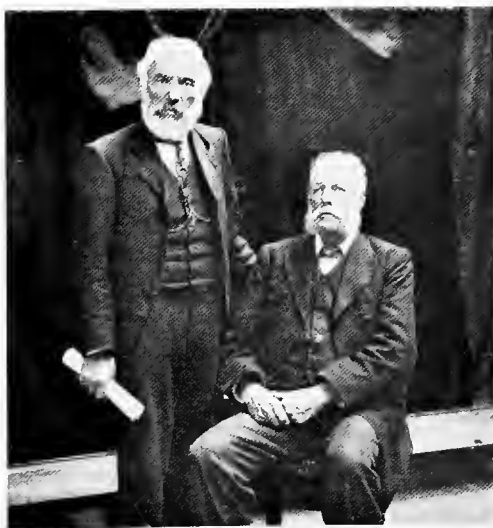


STAFF OF THE GRANVILLE TECHNICAL SCHOOL.

Reading from left to right—

Back row—Wm. Anderson, Boiler-making; C. J. Hasemer, Mechanical Drawing; J. B. Prowse, Shorthand; E. F. Rowley, Mechanical Drawing; C. A. Oxley, Geometrical Drawing.

Front row—Alf. Coffey, Art; J. B. Brown, Resident Master; Miss Geiger, Assistant Art; H. Lord, Agriculture; S. Rutherford, Carpentry.



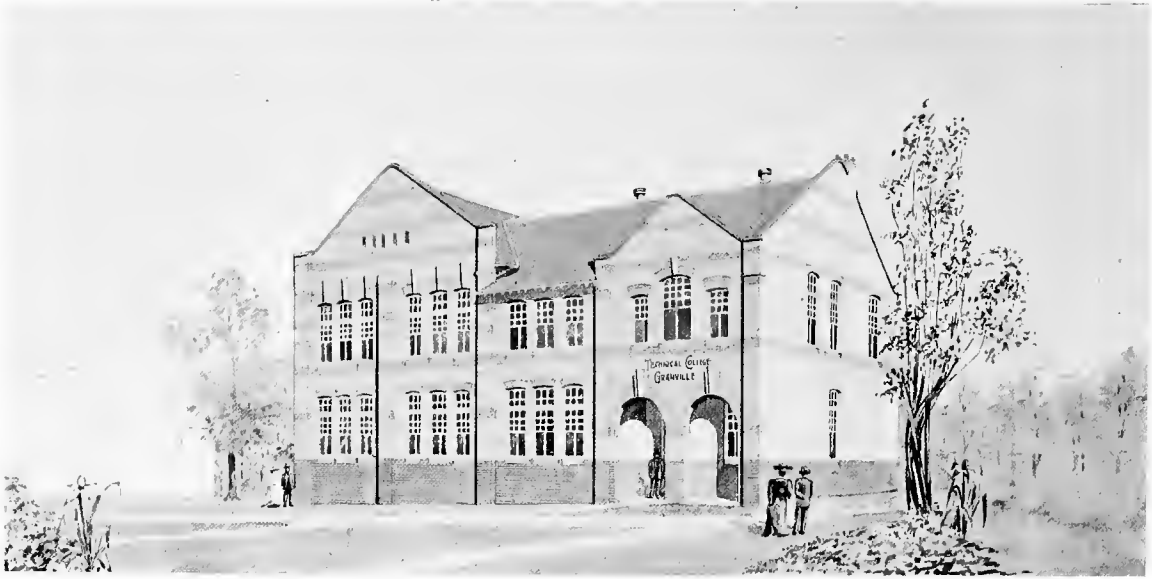
MR. NOBBS, M.L.A. (SITTING), AND MR. BROWN,
The Chairman and Resident Master at the First Prize Presentation at Granville.

The successes attained by students and ex-students in the world of work and enterprise have been most gratifying, especially as they are attributed largely, by the students themselves, to instruction received in this school.

fourteen teachers, the classes having an enrolment last year of 447 students in place of the two dozen of twenty-four years ago. Altogether over two thousand individuals have been taught in this school, a large number of them attending classes for many years.

The first meeting for the presentation of certificates was held early in 1886, when Mr. John Nobbs, then President of the School of Arts, now member of Parliament for the district, presided and presented the certificates in the presence of a small gathering of students, and one representative of the outside public; these meetings have grown so much in public interest that now the Town Hall is on these occasions crowded with friends of Technical Education, who enthusiastically greet the announcement of the successes of the students.

With the erection of the new College building, a perspective view of which is shown on the following page, a vast increase of attendance may be expected, as in most of the departments the present classes are uncomfortably overcrowded.

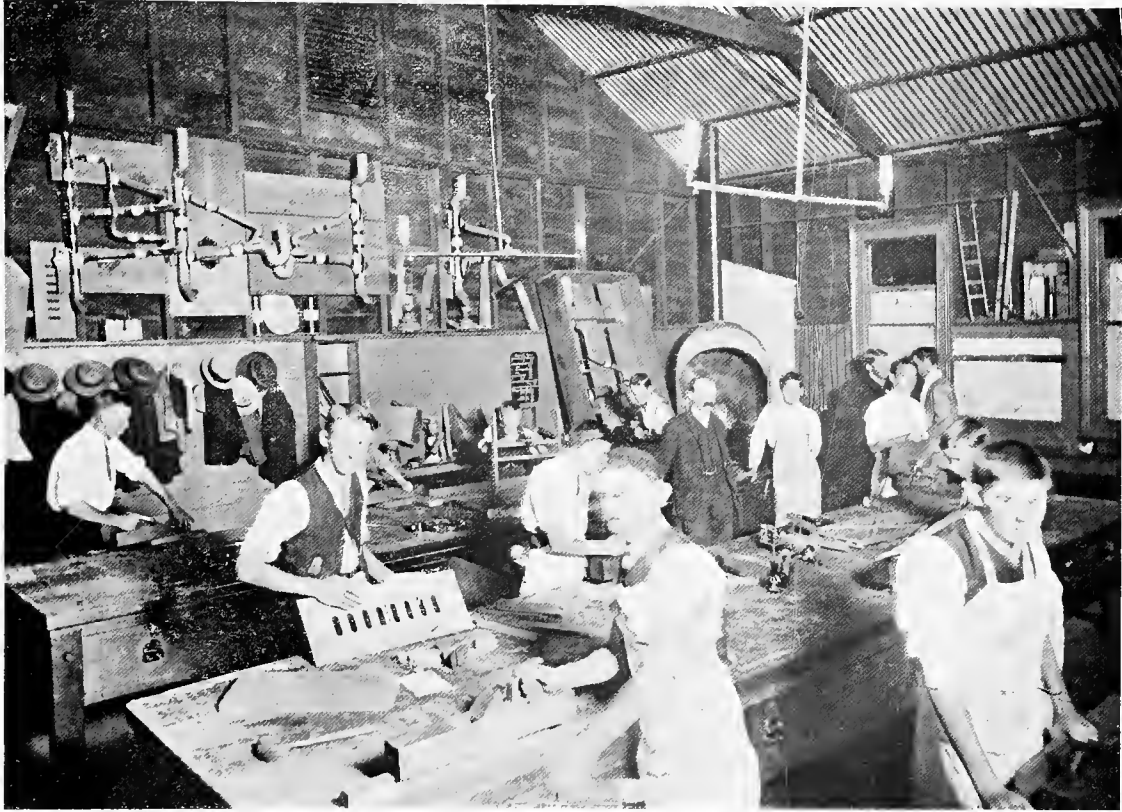


PERSPECTIVE VIEW FROM ROUGH SKETCH OF PROPOSED NEW COLLEGE.
By a Student of the Drawing Class.



MECHANICAL DRAWING CLASS.
Students at Work.

One of the first students has for several years occupied an important position under the Fremantle Harbour Trust, W.A., and taught classes in Perth Technical School. Three are managers in large engineering works in this State, while other three are employed as foremen in similar works. Half a dozen have risen to the position of Chief Engineer in ocean-



CARRIAGE BUILDING AND PLUMBING CLASS-ROOM.

Carriage Building Students at Work.

going steamers, two of them in mail-boats. One supervised the erection and has successfully run for nearly six years the municipal electric light and power plant of an important town in Tasmania, while another is engineer in Ultimo Power House. One rose from the position of chainman to that of assistant engineer in the Works Department, another is chief draughtsman in the largest ironworks in this State, while his brother occupies a similar situation in West Australia. Two have attained to positions of trust with large engineering firms in Britain, and another with a similar firm in America. One who went to England with the view of further prosecuting his architectural studies has achieved considerable success in competitions and won a valuable scholarship, another occupies a position of trust as an architect in Sydney, while another who carried out some of the best decorative work in the New Zealand Exhibition is now managing partner in the firm by which he was employed. A lady art student's designs from Australian flora were accepted by a leading British firm of Art potters. The most successful exhibitor at the Agricultural and Horticultural Shows in this district is an ex-student of our Agricultural Class.



MISS SMALLWOOD,

Teacher of Dressmaking for Granville and the Illawarra District.

The demand for youths trained in this school, by local employers usually exceeds the supply, and as the same employers apply repeatedly it is evident they are satisfied with the quality supplied.



THE CARPENTRY CLASS-ROOM.
Students at Work.

PROGRAMME OF CLASSES.

GRANVILLE TECHNICAL SCHOOL.

Classes meet at the School of Arts, Granville.

MATHEMATICS, ARITHMETIC, ALGEBRA, GEOMETRY, TRIGONOMETRY, GEOMETRICAL DRAWING, MECHANICAL DRAWING, APPLIED MECHANICS (ELEMENTARY DRAWING AND ADVANCED), PERSPECTIVE DRAWING—James B. Brown, Certificated Teacher by Science and Art Department, South Kensington, London; Assistant Teachers: C. J. Hasemer, C. A. Oxley, and E. F. Rowley.

FREEHAND, MODEL, PLANT, ANTIQUE, AND BLACK AND WHITE DRAWING, FLOWER PAINTING, AND DESIGN—Alfred Coffey; Assistant Teacher: Miss Geiger.

AGRICULTURE (ELEMENTARY AND ADVANCED)—Henry Lord, Graduate Trois Croix Agricultural College, Rennes, France. SHORTHAND—J. B. Prowse. DRESSMAKING—Miss Smallwood. PLUMBING—A. H. Juleff. CARPENTRY—S. Rutherford. CARRIAGE-BUILDING—A. C. Cooper. BOILER-MAKING—Wm. Anderson. FITTING AND TURNING.

Goulburn Technical College.

(By A. J. SACH, F.C.S., Resident Master in charge.)

THIS College was established in 1885-6, and the present resident master, Mr. A. J. Sach, F.C.S., has had charge since 1886. In 1900 the fine buildings now in use were commenced, and were



THE STAFF OF GOULBURN TECHNICAL COLLEGE.

Reading from left to right :
Front row—Miss Stewart, Shorthand, &c. ; Mr. Sach, Resident Science Master in charge ;
 Mrs. Iredale, Cookery ; Mr. Gardner, Book-keeping ; Mr. Spragg, Plumbing.
Back row—Mr. Burness, Fitting and Turning ; Miss Hill Slade, Art ; Mr. Lockley,
 Carpentry, &c.

Antique, Black and White, and Still Life. The Women's classes include Dressmaking, Millinery, Laundry, and Cooking. The accommodation provides for a Museum and Art Gallery 60 ft. x 30 ft., containing twenty-one Oil and Water Colour Paintings from the National Collection, and 4,000 specimens of raw and manufactured materials. There is a Demonstration Hall, for Lectures and College gatherings ; a chemical laboratory 30 ft. x 20 ft. ; Physics room 20 ft. x 15 ft. ; Dressmaking, Millinery, Art room, and Cooking school, each 30 ft. x 20 ft.

THE SCIENCE CLASSES embrace Practical and Theoretical Chemistry, Mineralogy, Assaying, Physics, and Geology ; these have continued for over twenty years, and have afforded opportunities to many, in the form of broad education and utility.

THE WOOD-WORKING CLASSES include provision for the teaching of Carpentry, Wood-turning, Wood-carving, and Trades Drawing, and for many years have provided for the teaching of Manual Training at the Goulburn Public Schools.

publicly opened on 14th March, 1901, by the then Minister, The Hon. John Perry. The training that the College offers may be divided into (a) Scientific, (b) Commercial, (c) Trade, (d) Art (e) Women's or Domestic Training. The Sciences taught include Chemistry, Physics, Mineralogy, Assaying, Geology, and Agriculture ; they have appropriate laboratories and appliances. The Commercial classes include Arithmetic, Book-keeping, Shorthand, and Typewriting ; the Trade classes include Fitting and Turning, Plumbing and Ironworking, Training in Sheep and Wool. Wood-turning, Trades Drawing, Mechanical Drawing, and Carpentry. The Art classes include Freehand, Model, Geometrical, Perspective,



EXTERIOR OF GOULBURN TECHNICAL COLLEGE.

The Science teaching of the Public School pupils has been pursued for about fifteen years, the individuals numbering about one hundred for the year.

Although the local train service is by no means encouraging, yet students have travelled all distances up to 50 miles, and the thanks are due to the Railway Commissioners for the

reduction in fares. During the last two or three years, teachers from the Goulburn College have travelled in order to give instruction in adjoining centres of population, the subjects taken up being Dress-making, and Millinery and Art. The towns visited are Cooma, Queanbeyan, Bungendore, and Yass.

THE SHEEP AND WOOL CLASS is housed in a separate building, and is supplied with samples of wool drawn from various districts. The students come from distances up to 30 miles.

CARPENTRY CLASS.—The rooms devoted to the teaching of wood-working in the Goulburn Technical College are situated on the ground-floor, at the south-eastern corner of the building.



**GOULBURN MILLINERY STUDENTS AND THEIR TEACHER,
AT DOOR OF COLLEGE.**

The Carpentry Workshop is 48 feet long and 30 feet wide, and contains eleven benches of good design and solid form, the under part of benches being made up into cupboards which contain the greater part of the tools used in the class-room.

An adjacent room is used as class-room, in which Constructional and Trades Drawing is taught, and which also holds the various plates and models used in the teaching.

The workshop is also provided with two wood-turning lathes, the power necessary for the driving of which, is supplied by a two-and-a-half horse-power gas-engine. The classes are largely availed of by the youth of the town in obtaining a knowledge of all pertaining to elementary and advanced wood-working, building construction, and wood-turning, while many ladies have been taught the art of wood-carving, both chip or geometrical, and relief carving.

Many, whose daily occupations do not directly deal with wood-working, come to the class to be taught the correct manipulation of wood-working tools, and the proper method of making the many joints required in the construction of household furniture, &c.



**DRESSMAKING AND MILLINERY STUDENTS AT COOMA,
AND THEIR TEACHER.**

A very large number of youths from the country around Goulburn have also availed themselves of the teaching to become more proficient in the execution of the many jobs which are constantly being done on farming and pastoral properties, where they are daily engaged.

The teaching given has undoubtedly helped all the students in seeing more clearly the necessity of combining a good theoretical knowledge with practical skill, and a very good proportion have been enabled to win and accept positions which would otherwise have been filled by others, from centres where similar training is given.

The certificates gained by the students have been the cause of many of them gaining preference when the engagement of youths for Government employ has been under consideration.

Teaching is carried on at times most convenient for those residing in the town and country, and all can avail themselves of tuition during the week, or at the end of it, when Saturday morning classes are held.

THE FITTING AND TURNING CLASSES. — The Fitting and Turning Workshop is held in a room 40 feet long by 36 feet wide. It is equipped with the following tools: One four horse - power gas - engine, three lathes, one drilling machine, one shaping machine, one twist drill grinder, marking-off table, benches, and vice, and a number of other smaller tools; also, smith forges, anvils, and tools.



DRESSMAKING AND MILLINERY STUDENTS AT QUEANBEYAN, AND THEIR TEACHER, MISS FORTESCUE.

The work of the students in the first year's instruction consists mainly in the use of the hammer, and chipping, tempering, and sharpening chipping chisels, filing, fitting, and scraping. screwing and tapping by hand. At the bench the aim is to give the students an intelligent understanding of the way to use their tools most efficiently.

The second year's course continues on similar lines as to workshop practice, all the machines and tools in the workshop being brought into practical use. At the lathes, instruction is given in their construction, use of the slide rest, appliances to be used for special forms of work, turning and boring speeds, and screw-cutting; showing the proper shape and angle of tools, and the best methods for hardening and tempering them. The adjustment of change wheels for single or multiple threads of any required pitch, calculating the wheels for screw-cutting, cutting speeds, and the calculation of the time work should take in execution.

The Continuation Class takes in the following subjects: Farm blacksmithing, welding iron, making split and solid links, laying and steeling picks, crowbars, and plough-shares, making gate hinges and hooks.

In all the classes the theory as well as the practical mechanical work is taught, and to aid in this, periodical lectures are given, with the help of blackboard, notes, and sketches.

THE PLUMBING AND IRONWORKING CLASSES.—The Plumbing, Tinsmithing and Iron-working Classes have been in progress about two years; the Plumbing Shop is fitted up with well-constructed benches, lockers, furnaces of different descriptions, and all kinds of appliances



THE PLUMBING CLASS-ROOM AT GOULBURN COLLEGE.

necessary for the bending, wiping, soldering and working of sheet lead, as required in the plumbing trade.

Classes in Tinsmithing and Ironworking have all the latest designs of rollers, folders, burring machines, and all other tools required to turn out work from the ordinary pannikin to the jointing, mitreing of down-pipes, gutters, and the striking out and fitting together of ornamental rain-water heads.

These classes are well attended by those engaged in the plumbing trade, and a great deal of interest is taken in them by the Master Plumbers, one of whom gives a donation of a guinea to the student who obtains the highest number of marks during the year.

The modern style of work which is taught at this class has been adopted in several of the

latest buildings in the town, and also in the large residences in the surrounding districts, and so has proved to be a beneficial object lesson to many others. besides those actually attending the classes.

PROGRAMME OF CLASSES.

GOULBURN TECHNICAL COLLEGE.

Resident Science Master in Charge of the College.

A. J. SACH, F.C.S. (Certificated Battersea-Trained Teacher, and by Science and Art Department, South Kensington, London).

INORGANIC CHEMISTRY, MINERALOGY, GEOLOGY, ASSAYING, MAGNETISM AND ELECTRICITY AND HEAT, PHYSICS, MECHANICS, SOUND, AND LIGHT, ELEMENTARY ART, AGRICULTURE—A. J. Sach.

ADVANCED ART—Still Life, Antique—Miss M. A. Will-Slade.

BOOK-KEEPING—Double Entry—Chas. Gardner.

MILLINERY—Miss Ada Fortescue.

SHORTHAND, TYPEWRITING—Miss M. Stewart.

SCIENTIFIC DRESSCUTTING AND DRESSMAKING—Miss I. Cox.

TECHNICAL ARITHMETIC—A. J. Sach.

CARPENTRY AND JOINERY, WOOD TURNING, BUILDING CONSTRUCTION AND TRADES DRAWING, WOOD CARVING (Chip and Relief)—T. B. Lockley.

MECHANICAL DRAWING—A. J. Sach.

FITTING AND TURNING—J. Burness.

COOKERY, DOMESTIC SCIENCE—Mrs. E. Iredale.

PLUMBING, TINSMITHING, AND IRONWORKING—G. B. Spragg.

SHEEP AND WOOL—C. E. Cowley.

Newcastle Technical College and School of Mines.

[By JOHN MITCHELL, F.L.S. (N.S.W.), Resident Science Master in Charge.]

THE first Technical Classes established in Newcastle were started by the Committee of the Newcastle School of Arts, and were held in the rooms of that institution in 1877, and subsequently.



THE STAFF OF THE NEWCASTLE TECHNICAL COLLEGE.

Reading from left to right—

Front row: Messrs. Webb, Boilermaking; Jones, Carpentry, &c.; Collins, Coal-mining; Mitchell, Resident Master in Charge; Gardiner, Mine-surveying; Scarfe, Fitting and Turning; Morrison, Applied Mechanics and Mechanical Drawing.
Second row: Mr. Kennedy, Plumbing; Miss Searunt and Miss Watt, Cookery Attendants; Miss Feakes, Cookery; Miss Rich, Dressmaking; Rev. Mr. Bowles, Book-keeping; Mr. Ross, Blacksmithing.
Third row: Messrs. Bearby, Patternmaking; Griffiths, Shorthand; Bennetts, Engineer's Assistant; Bardsley, Laboratory Assistant; Giddy, Hon. Assistant Science Teacher; Christmas, Mathematics.

Note.—Five of the Staff are absent from this group.

The subjects taught were—Elocution, Grammar, French, and Mechanical Drawing. In 1883 a deputation, representing the citizens of Newcastle, waited upon the Minister for Public Instruction of the day, and brought under his notice the claims of Newcastle and district to have properly constituted technical classes established under the control of the Department of Public Instruction. The representations of the deputation appear to have been satisfactory, for in 1884 arrangements were completed by the Minister with the School of Arts Committee to provide accommodation for classes, and the late Mr. John Pentecost, A.R.S.M., was appointed to the position of Science Master, with local control of all the technical classes in the district.

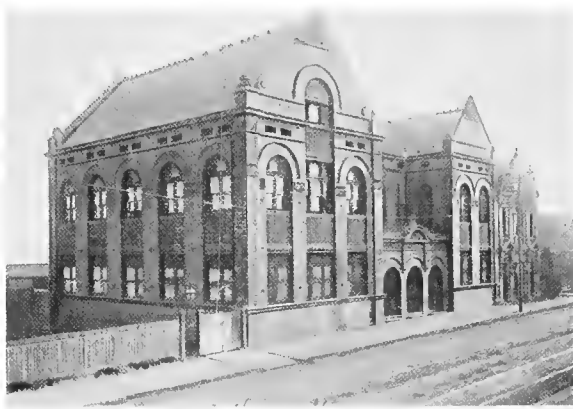
The following classes were started in 1884:—Chemistry and Mineralogy, under Mr. Pentecost; Mechanical Drawing and Building Construction—Mr. W. Alsop, Teacher; Shorthand—Mr. C. Christie, Teacher; Freehand, Model, and Perspective Drawing in charge of Mr. R. A. Smith. The gross enrolment of pupils was 161. Subsequently classes for instruction in Coal-mining were opened at Newcastle and various district centres.

In 1893 the Newcastle Technical Classes were removed to the old Court-house premises, and as an adjunct to the classes a Technological and Natural History Museum was opened. In 1896 the present Technical College and School of Mines buildings in Hunter-street West were completed, and the classes and museum removed thereto. From this time the work of technical education has continued to grow, and especially has this been the case with the trades classes: and though additional workshops have been erected apart from the original building, and a new class-room for the Plumbers is about to be erected, the class accommodation is far from adequate. For 1908 the individual enrolments were 661; consisting of 472 males, and 189 females. Additional to these, in the coal-mining centres affiliated with the College, there were eighty-one individuals attending coal-mining and mine-surveying classes.

At the College and centres forty classes were in operation, affording instruction in Metallurgy, Assaying, Chemistry, Physics, Geology, Mineralogy, Metalliferous Mining, Coal-mining, Mine-surveying, Mechanical, Freehand, Model, Geometrical, Perspective, and Plant Drawing, Design (Art), Machine Design, Fitting and Turning, Applied Mechanics, Boiler-making, Pattern-making, Blacksmithing, Plumbing, Carpentry and Joinery, Staircasing and Hand-railing, Wood-carving, Dressmaking, Millinery, Cookery, Shorthand, Bookkeeping, French, Mathematics, Botany, and Physiology; and, as an experiment, an industrial continuation class for boys between the ages of 14–16 years has been started, in which the pupils are being taught the subjects considered to be most essential for persons intending to follow some craft in iron- or wood-working.

Newcastle is a mining, industrial, and commercial centre, and the instruction most sought is such as has to do with these sides of social economics: and on examining the records of the Coal-mining, Mine-surveying, Plumbing, and Engineering classes of the College the fact is revealed that inestimable benefits have been conferred on a very large number of those who were students. The instruction they obtained in the classes enabled them to reach positions that otherwise they never could have aspired to.

Of those who have attended the Coal-mining classes at the College and district centres in past years thirty-eight now hold colliery managers' certificates, and most of them hold the position of colliery manager; some of them are Government Colliery Inspectors. Forty-eight others are holders of second-class or under-managers' certificates, and are employed in responsible positions. A very large number of other ex-students and present students hold positions of responsibility as deputies, shot-firers, &c., that they could not hold without the knowledge acquired by them at the classes. Of those who have passed through the Mine-surveying classes thirty-eight are employed in the collieries of the Commonwealth as mine-surveyors. Of those who have been members of the Plumbing classes forty-four have become licensed plumbers, and a few others sanitary inspectors. Many from the Engineering classes gained chief engineer's certificates, and others have gained advancement as mechanics.



NEWCASTLE TECHNICAL COLLEGE AND SCHOOL
OF MINES.

The Wood-working classes have done good work. Teachers and others have been largely assisted by the Science and Art classes.

To print a complete list of all the ex-students who have succeeded in their professions and trades would take up far too much space, but enough has been said to prove that much good has been effected by the Technical Classes in Newcastle and district during the twenty-five years they have been in operation; and this has resulted in spite of the early disabilities in the way of indifferent equipment and accommodation, and too frequently indifference or even direct antagonism from quarters where support and encouragement might reasonably have been expected.

The future prospects of Technical Education in this district are bright, and proper accommodation being provided the present number of students could be largely increased.

The present teaching and lecturing staff of the College and centres is as follows:—John Mitchell, F.L.S. (N.S.W.), Resident Science Master in Charge; V. B. Collins, C.C.M., Lecturer in Coal-mining; A. Gardiner, C.C.M., Lecturer in Mine-surveying; H. J. Scarfe, Engineer in Charge; D. Morison, Lecturer in Applied Mechanics; H. Webb, Teacher of Boilermaking; A. A. Bearby, Teacher of Patternmaking; J. C. Ross, Teacher of Blacksmithing; Thos. Kennedy, Teacher of Plumbing; W. E. Jones, Teacher of Carpentry and Joinery, Wood-carving, Manual Training, &c; T. T. Flynn, B.Sc., Teacher of Physics; J. A. Hollings, Teacher in Art; C. H. Christmas, B.A. (Syl.), Teacher of Mathematics; Rev. R. M. Bowles, Teacher of Book-keeping; J. Griffiths, Teacher of Shorthand; Mrs. Everist, Teacher of French and German; John Bennetts, Assistant to the Engineer; Thos. G. J. Giddy, Honorary Assistant to the Science Master; and Jas. J. Fryer, Honorary Teacher of English; Miss Feakes, Teacher of Cookery.

PROGRAMME OF CLASSES.

NEWCASTLE TECHNICAL COLLEGE.

Resident Science Master in Charge: JOHN MITCHELL, F.L.S., of N.S.W.

Classes meet at the Technical College, Newcastle West.

CHEMISTRY—John Mitchell. MECHANICAL DRAWING, APPLIED MECHANICS—D. N. Morison. METALLURGY, MINERALOGY, PHYSIOLOGY—John Mitchell. COAL-MINING—V. B. Collins. FITTING AND TURNING—H. J. Scarfe. BLACKSMITHING—J. C. Ross. PATTERNMAKING—A. A. Bearby. BOILERMAKING—Henry Webb. DRESSMAKING, MILLINERY—Miss Rich. GEOLOGY—John Mitchell. MINE SURVEYING—Archibald Gardiner. PLUMBING—T. Kennedy. ADVANCED ART, FREEHAND DRAWING, MODEL DRAWING, PERSPECTIVE, PRACTICAL, PLANE, AND SOLID GEOMETRY, MODELLING—J. A. Hollings. SHORTHAND—J. Griffiths. COOKERY—Miss Feakes.

COAL-MINING—V. B. Collins, Public School, Plattsburg; Public School, Minmi; Public School, West Wallsend; Public School, Teralba; A. Gardiner, Public School, Dudley. MINE SURVEYING—V. Collins, Public School, Minmi; Public School, Teralba; Public School, West Wallsend; Public School, Plattsburg; A. Gardiner, Public School, Dudley. CARPENTRY, MANUAL TRAINING, WOOD-CARVING—W. E. Jones. BOOK-KEEPING—Rev. R. M. Bowles. MATHEMATICS—C. H. Christmas. BOTANY—J. Mitchell. SLIDE RULE. FRENCH, GERMAN—Mrs. Everist. PHYSICS—T. T. Flynn.

West Maitland Technical College.

(By JAMES A. HOLLINGS, Resident Art Master, in charge.)

Technical classes were first established in this district in 1885. Through the efforts of Messrs. John Pender, R. A. Young, C. E. Norrie, J. Gillies, M.L.A., and other residents, a room was offered by the Committee of the School of Arts for a commencement. Art classes were formed and the writer appointed Instructor. The School of Arts was not then the up-to-date building that it now is, and the room then available was found to be too small and otherwise not suitable. A move was then made to the Superior Public School, and in the following year to premises in Freechurch-street, adjoining the Girls' School. The class-rooms of the last-named institution were also brought into requisition.

In 1888 Mr. Harry Clemens was appointed Mathematical Master, and at the end of the following year the Department of Public Instruction took control of the work. In 1890 development went on rapidly under the Directorship of the late Mr. F. Bridges; and in the year 1892 several teachers (recruited principally from the ranks of the ex-students) had been added to the staff. Mr. Edward Nash, Architectural Drawing, Mechanical Drawing and Building Construction; Mr. Felix Coles and his Assistant, Mr. J. B. Noad, Carpentry and Joinery, Wood Carving, Wood Turning, Manual Training and Fret-cutting; Mr. John Pentecost, F.C.S., then also the Resident Master at the Newcastle Technical College, took classes in Chemistry (practical and theoretical); Mr. Charles Giles, Book-keeping; Mr. John Gillies, junior, Shorthand and Typewriting; and Miss Alice Fraser, Dressmaking.

In 1893 the Hon. Sir J. H. Carruthers, then Minister for Public Instruction, authorised the purchase of the site in High-street upon which the old Factory building now in use for the Technical College is located. These old buildings though roomy as to floor space were, as the illustrations show, far too low in the ceilings to make suitable class-rooms or workshops, and became very close in the hot weather.

The authorities quite realised the industrial prospects of the district, and a building suitable for the requirements was contemplated when the site was acquired.

After careful consideration plans were prepared for the building shown in the illustration opposite and, as the tenders have now been signed for its erection, it will not be long before the College is provided with an up-to-date home.

The recent opening up of the great coal-fields in the district near the town, has given an immense impetus to its population, and commerce, and has rendered the early provision of suitable Technical College accommodation especially necessary, as the old rooms would have been quite inadequate to meet growing needs.

In the early days the classes (especially the Art classes) were greatly assisted by the interest taken in the work by the Committees of the Agricultural Associations at Maitland and Singleton. These committees offered prizes for art and other work by the students, and these were eagerly competed for. In 1899 Mr. Tom Roberts, the eminent artist, who was the judge at the Singleton Art competition, was very complimentary as to the quality of the students' work sent, and Mr. Julian Ashton, who adjudicated at the Maitland Art competition, expressed himself as extremely pleased with the work.

In the case of the competition work sent by the other classes, such as Mechanical Drawing, Carpentry, Wood Carving, Plumbing, &c., the reports of the Judges, Messrs. J. W. Pender, E. Hackett, R. Pender, &c., have been equally satisfactory.

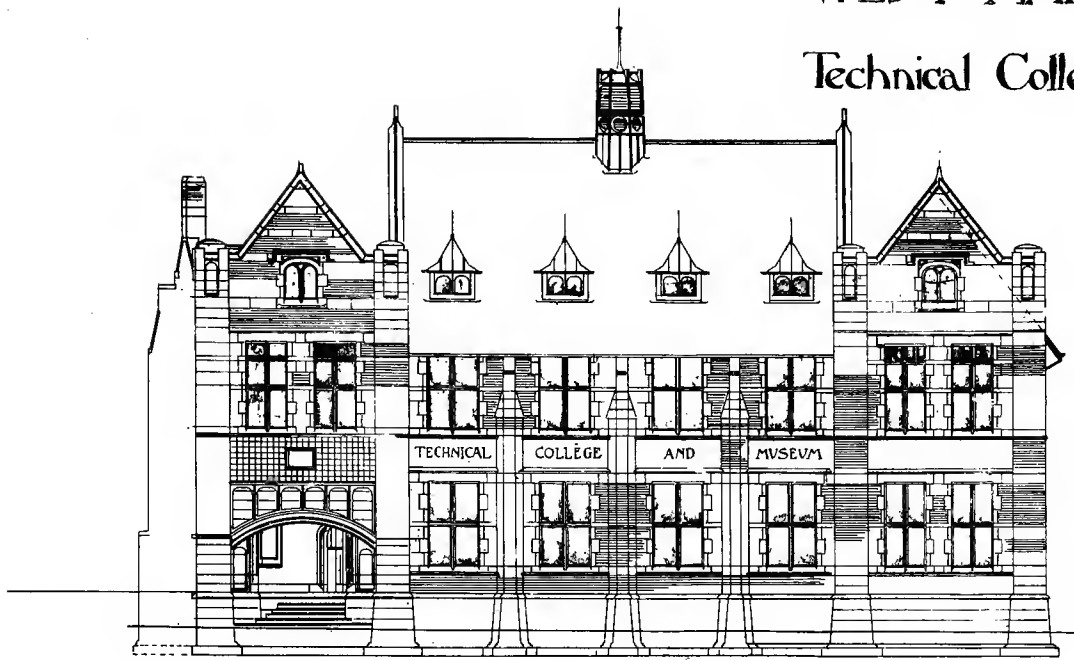
Many of the students have been greatly assisted in improving their positions through the classes. Mr. Partridge Wall, a large contractor, qualified for a responsible Civil Service position, when quite a young man; Mr. C. Pender, through his work in the Mechanical Drawing and Building Construction Classes was assisted in obtaining an important position with the



PRESENT COLLEGE BUILDING.

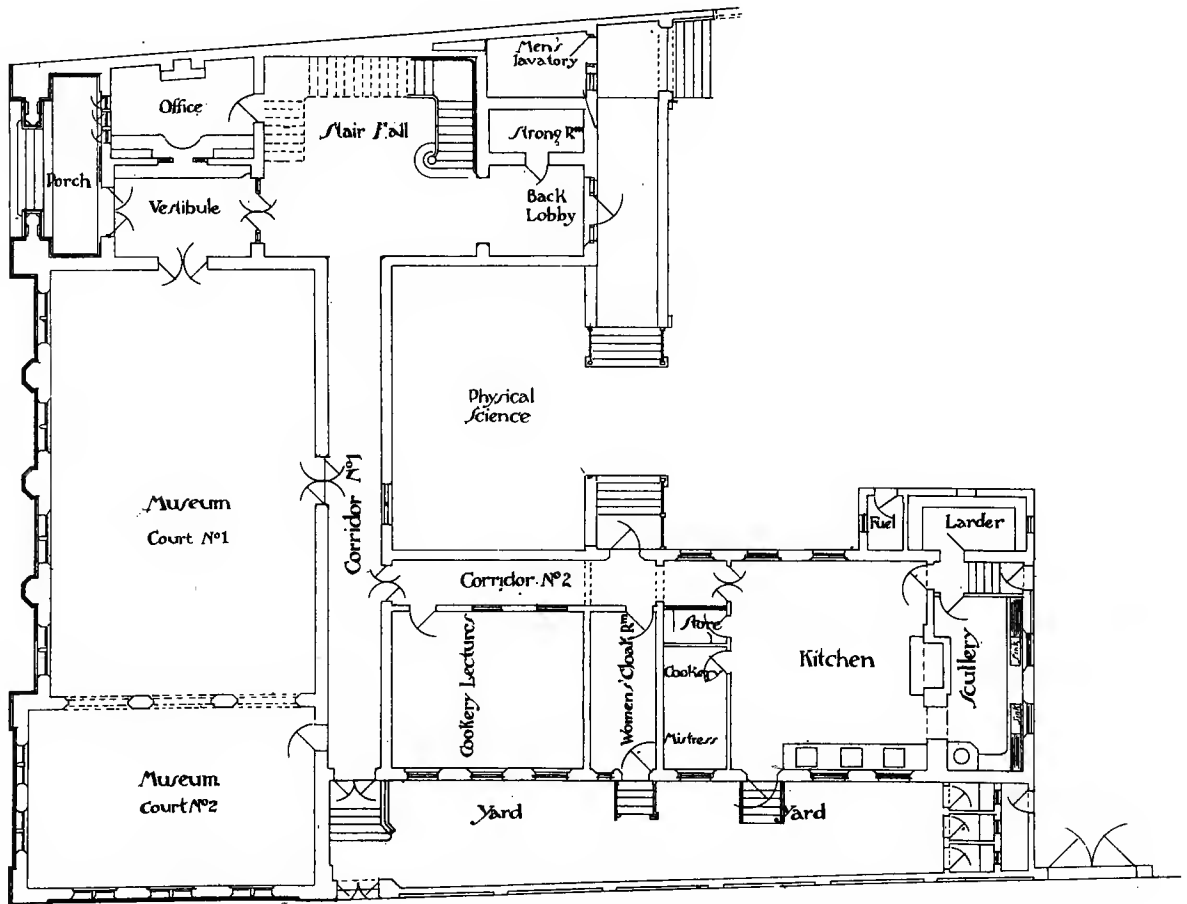
WEST MAITLAND

Technical College.



790.
8' 3.05.

Elevation to High Street





MRS. SMITH,
Dressmaking.



MISS BREWSTER,
Botany and Geology.

College



MR. NOAD,
Carpentry and Joinery, &c.



MR. HOLLINGS,
Resident Master in Charge.

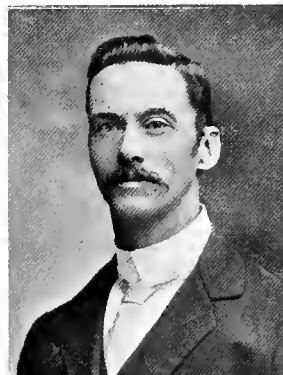


MR. NASH,
Building Construction and Mechanical
Drawing

West



MR. YEATES,
District Art Classes.

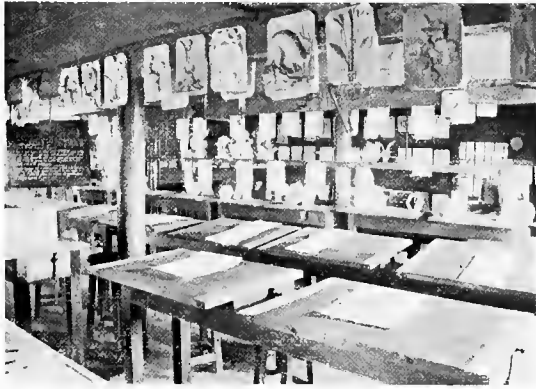


MR. BROADFOOT,
Hon. Assistant, Botany and Geology.

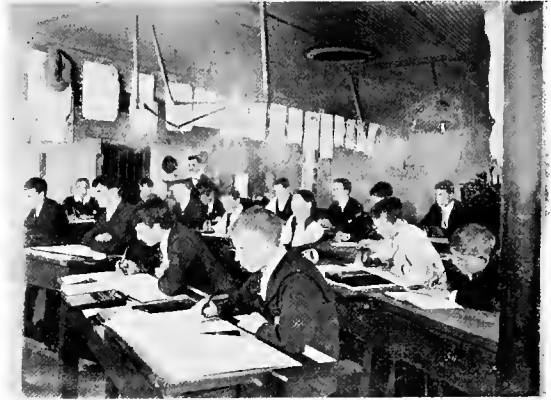
Maitland



MR. FLYNN,
Chemistry.



MODEL, & C. DRAWING CLASS-ROOM.



MECHANICAL DRAWING CLASS-ROOM.

West
Maitland

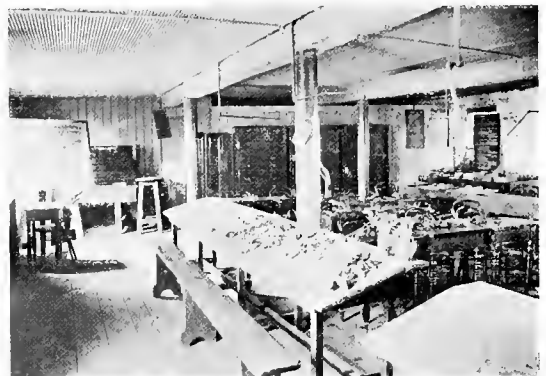


COOKERY CLASS-ROOM.

College
Class
Rooms.



CHEMISTRY CLASS-ROOM.



BOTANY AND GEOLOGY CLASS-ROOM.

Colonial Sugar Company in Queensland; Mr. Geo. Walters was appointed Teacher of Plumbing at Hobart Technical College from our Maitland Class; Messrs. Filmer Bros., two clever electrical engineers, were most industrious students of Chemistry, &c.; and many of our local business men have been helped largely, through their studies in the various classes.

The subjects taught at the present time are detailed in the programme of classes which follows this article.

It will be noticed that there are District Classes (principally Art) at Singleton, Clarence Town, Raymond Terrace, Morpeth and Hinton. At Kurri Kurri, the principal mining town of the district, are useful classes for the study of Coal-mining and Mine-surveying. The population of this large industrial field is coming to value the work done at the College and District Schools, and the young men are looking to the branch for instruction in Electricity, &c.

PROGRAMME OF CLASSES,

WEST MAITLAND TECHNICAL COLLEGE AND DISTRICT SCHOOLS.

Resident Art Master in Charge—JAMES A. HOLLINGS.

Classes meeting at Technical College, West Maitland.

PLUMBING—Geo. Lamont. TRADES DRAWING—J. B. Noad. BUILDING CONSTRUCTION, MECHANICAL DRAWING—Edward Nash. CARPENTRY AND JOINERY, MANUAL TRAINING (Day Classes for Boys), WOOD-CARVING (Ladies' Class), WOOD-TURNING—J. B. Noad. FREEHAND DRAWING; GEOMETRY, PLANE AND SOLID; MODEL DRAWING; PERSPECTIVE; MODELLING; ADVANCED ART—J. A. Hollings. DRESSMAKING—Mrs. Kate Smith. SHORTHAND—H. M. Cotteril. BOTANY, GEOLOGY—Miss Brewster. CHEMISTRY (INORGANIC)—Theoretical, Practical; (ORGANIC)—T. Flynn, B.Sc. COOKERY, BOOK-KEEPING, MATHEMATICS—As arranged for.

Classes meeting at Boys' High School, East Maitland.

GEOMETRICAL DRAWING—J. A. Hollings; Assistant, G. Yeates. MANUAL TRAINING—J. B. Noad.

Class meeting at Girls' High School, West Maitland.

FREEHAND DRAWING—J. A. Hollings.

Classes meeting at Technical Class-room, Public School, East Maitland.

PERSPECTIVE, PLANE AND SOLID GEOMETRY, FREEHAND DRAWING, MODEL DRAWING—G. Yeates.

Classes meeting at Seaham.

FREEHAND, MODEL, GEOMETRICAL, AND PERSPECTIVE DRAWING—G. Yeates.

Classes meeting at Clarence Town.

FREEHAND, MODEL, GEOMETRICAL, AND PERSPECTIVE—G. Yeates.

Classes meeting at Raymond Terrace.

FREEHAND, GEOMETRICAL, MODEL, AND PERSPECTIVE DRAWING—G. Yeates. DRESSMAKING—Miss Macourt.

Class meeting at Miller's Forest.

DRESSMAKING—Miss Macourt.

MORPETH TECHNICAL SCHOOL.

Classes meeting at the Public School.

FREEHAND, MODEL, GEOMETRICAL, AND PERSPECTIVE DRAWING—G. Yeates.

HINTON TECHNICAL SCHOOL.

Classes meeting at the Public School.

FREEHAND, MODEL, GEOMETRICAL, AND PERSPECTIVE DRAWING—G. Yeates.

SINGLETON TECHNICAL SCHOOL.

Classes meeting at the Technical Class-room, Public School.

FREEHAND DRAWING, MODEL DRAWING, GEOMETRY (PLANE AND SOLID), PERSPECTIVE—G. Yeates.

KURRI KURRI TECHNICAL SCHOOL.

Classes meeting in Public School.

COAL-MINING AND MINE-SURVEYING—V. B. Collins.

CESSNOCK TECHNICAL SCHOOL.

COAL-MINING AND MINE-SURVEYING—V. B. Collins.

The West Maitland Technological Museum is open to the Public on Monday, Tuesday, Wednesday Thursday, and Saturday.

Albury Technical College.

(By WM. POWRIE, Resident Master.)



MR. POWRIE,
Resident Master, Albury Technical
School.

The Albury Technical College was opened on 23rd March, 1899, with classes in Freehand, Model, Geometrical, Perspective, and Trades Drawing; Wood-carving, Carpentry, and Manual Training. During the year, classes in Shorthand were also opened. In the following year (1900) classes in Dressmaking, &c., were established. During 1906 classes in Millinery were opened, and during 1908 Theoretical and Practical Chemistry were added to the list of subjects taught.

During the time Technical Classes have been in operation in Albury sterling work has been done, and evidence of the advantages derived by those who have passed through the College is not wanting.

Some of the employers of labour appear to approve and to appreciate the work being done, inasmuch as they state when advertising for hands that preference will be given to those who have studied at the Technical College.

PROGRAMME OF CLASSES.

ALBURY TECHNICAL COLLEGE.

Resident Master in Charge, WILLIAM POWRIE.

FREEHAND DRAWING, MODEL DRAWING, GEOMETRICAL DRAWING, PERSPECTIVE AND TRADES DRAWING
CARPENTRY AND JOINERY, WOOD-CARVING, MANUAL TRAINING, CHEMISTRY (THEORETICAL),
CHEMISTRY (PRACTICAL).

Country Technical Schools.

In addition to the country colleges, detailed descriptions of which have already been given, the following Technical Schools and classes are in operation at various centres throughout the State of New South Wales:—

LITHGOW TECHNICAL SCHOOL.

L. HENRY, Teacher in charge.

Classes meet at the Public School and at the Technical School.

FREEHAND DRAWING, MODEL DRAWING, PERSPECTIVE—Mr. R. Dennis. WOOD-CARVING—As arranged for. MATHEMATICS—L. Henry. BOOK-KEEPING—C. Cookson. SHORTHAND—A. W. Reid. CHEMISTRY (THEORETICAL)—H. V. Nicholls. GEOMETRICAL DRAWING—R. Dennis. PHYSICS—E. J. C. Rennie. COAL-MINING, MINE-SURVEYING—John Durie. PRACTICAL CHEMISTRY—H. V. Nicholls. MECHANICAL DRAWING, APPLIED MECHANICS—W. Burtows. DRESSMAKING—Miss King. SANITARY INSPECTORS—D. Owen.

ARMIDALE TECHNICAL SCHOOL.

Classes meet at the (late) Olympic Hall, Jessie-street.

A. W. CHAPPLE, Teacher in Charge.

FREEHAND AND MODEL DRAWING, STILL LIFE, GEOMETRICAL DRAWING, PERSPECTIVE, PLANT DRAWING, ANTIQUE DRAWING, MODELLING, DESIGN, WOOD CARVING. CARPENTRY—E. Whitfield, Teacher. LANDSCAPE (SKETCHING)—Black and White, Life Class, Flower Painting. COOKERY—Miss B. Geddes, Teacher. WOOL-CLASSING—J. Hannaford.

COBAR TECHNICAL SCHOOL.

Classes meet at the District School, Cobar.

FREEHAND, MODEL, PERSPECTIVE, AND GEOMETRICAL DRAWING; MATHEMATICS (ARITHMETIC); ALGEBRA AND GEOMETRY; TRIGONOMETRY—A. W. Hicks, B.A. MECHANICAL DRAWING—T. C. Groom. CHEMISTRY—M. A. Sullivan.

TAMWORTH TECHNICAL SCHOOL.

Classes meet at the District School, School of Arts, and Council Chambers.

A. J. MCCOY, Teacher in Charge.

MATHEMATICS—A. J. McCoy, Teacher. ART—Freehand, Model, Geometrical, Antique, Plant and Perspective Drawing, Design, Wood Carving, and Life Class—A. W. Chapple, Teacher. CARPENTRY—R. Taylor, Teacher. BOOK-KEEPING.—J. A. McLeod, Teacher. DRESSMAKING, MILLINERY.—Miss E. Perel, Teacher. WOOL-CLASSING.

ORANGE TECHNICAL SCHOOL.

Classes meet at the Superior Public School, Orange.

FREEHAND AND MODEL DRAWING.—Miss Collingridge. GEOLOGY, BOTANY.—T. C. DWYER, B.Sc.

Scholarships and Bursaries.

SCHOLARSHIPS.

(A) Scholarships distinguished in these Regulations as (a) District and High School, (b) Agricultural, (c) Junior Technical, (d) Intermediate Technical, (e) Senior Technical, shall be awarded annually upon competitive examination to deserving pupils of schools within the State.

DISTRICT AND HIGH SCHOOL SCHOLARSHIPS.

District and High School Scholarships to the number of one hundred (100) annually shall be available for pupils of the following groups of schools, the number allotted to each group to be determined in connection with each half-yearly examination, and shall also be available for pupils in schools other than State Schools:—

Group (a)—Schools in Classes I and II.

Group (b)—Schools in Classes III and IV.

Group (c)—Schools in Classes V, VI, and VII, including Subsidised Schools.

Applicants from schools other than State Schools shall be included with one or other of these groups, as may be determined by the attendance of the school attended in each case.

(i) These Scholarships shall be tenable for three years at a District School, High School, Superior Public School, or, *in the case of boys, for two years at the Hurlstone Agricultural Continuation School or other similar school hereafter established*, and shall entitle the holders to free education at such schools and to a grant of text-books not exceeding in value *one pound ten shillings (£1 10s.) per annum*.

(ii) The holder of a Scholarship who elects to attend the Hurlstone or other Agricultural Continuation School, and who is unable on account of distance of his home from such school to attend as a day student, will be charged a residential fee at the reduced rate of five guineas (£5 5s.) per quarter.

(iii) Where the successful candidate elects to attend a Superior Public School which is not a District School, the Scholarship will be tenable at such school for a period of two years only, but will be extended to another year if the holder attends a school providing a third year course.

(iv) The examination for District and High School Scholarships will be open to all boys and girls under 15 years of age on the date of examination.

(B) AGRICULTURAL SCHOLARSHIPS TO HAWKESBURY COLLEGE.

Three Scholarships shall be awarded annually to students of the Hurlstone Agricultural Continuation School, or other similar school hereafter established, who have passed with greatest credit through the two-years' course at such school. The Scholarships shall be awarded on the record of the students at the school as shown by the report of the Principal, together with the results of the final examination, and shall entitle the holders to a two-years' course at the Hawkesbury Agricultural College, and to a grant of text-books not exceeding in value *one pound ten shillings (£1 10s.) per annum*.

(C) JUNIOR TECHNICAL SCHOLARSHIPS.

Junior Technical Scholarships to the number of twenty (20) annually shall be available for pupils of the following groups of schools, the number allotted to each group to be determined in connection with each half-yearly examination:—

Group (a)—Schools in Classes I, II, III, and IV.

Group (b)—Schools in Classes V, VI, and VII, including Subsidised Schools.

(i) Junior Technical Scholarships shall be tenable for two years at a Technical College or School or Continuation School for courses of instruction approved by the Minister, and shall entitle the holders to exemption from payment of fees and to grant of text-books not exceeding in value *one pound ten shillings (£1 10s.) per annum*, and, where such is necessary, to a travelling allowance not exceeding *five pounds (£5) a year*, to enable the holders to travel from and to their homes to and from the nearest Technical College or School where the desired course of instruction is available.

(ii) The examination for these Scholarships will be open to all boys and girls under 15 years of age on the date of examination.

(D) INTERMEDIATE TECHNICAL SCHOLARSHIPS: TO TECHNICAL COLLEGE COURSES.

Intermediate Technical Scholarships to the number of twelve (12) annually shall be awarded to boys to enable them to attend a Technical College for any one of the following day courses:—

Agriculture; Sheep and Wool Training; Chemistry, Assaying, and Metallurgy; Mechanical Engineering; Sanitary Engineering; Mining; Architecture; Art.

(i) These Scholarships will be tenable for three (3) years, and will entitle the holders to exemption from payment of fees and to a grant of text-books not exceeding in value *one pound ten shillings (£1 10s.) per annum*, and, where such is necessary, to a travelling allowance not exceeding *five pounds (£5) a year* to enable the holders to travel from and to their homes to and from the nearest Technical School where the desired course of instruction is available.

(ii) The examination for these Scholarships will be open to all boys *still attending school* over 17 years of age on the date of examination.

(E) SENIOR TECHNICAL SCHOLARSHIPS.

To organised Day Courses of Technical Colleges.

Four Scholarships shall be allotted annually in January of each year for competition amongst *youths in employment*, to enable them to attend the Organised Day Courses of the Technical Colleges.

(i) The candidates must be under 18 years of age on the 1st day of February following the entrance examination to the day courses.

(ii) The Scholarships will be tenable for three years, and will entitle the holders to exemption from fees, to a grant of text-books not exceeding in value *two pounds (£2) per annum*, and to a monetary allowance of *twenty pounds (£20) per annum*.

(F) FROM CLASSES IN SMALL TECHNICAL SCHOOLS TO ADVANCED CLASSES IN THE SAME SUBJECTS AT CENTRAL TECHNICAL COLLEGES.

Three Scholarships shall be awarded annually in January of each year to students distinguished in classes at small Technical Schools to enable them to attend the more advanced classes in the same subjects at a central Technical College, where such advanced classes are not held at the local Technical School or College.

(i) The Scholarships will be tenable for the remainder of the full course in the subjects taken, and will entitle the holders to exemption from payment of fees and to a grant of text-books not exceeding in value *four pounds (£4) per annum*. When a student holding a Scholarship must necessarily, as in most cases, board away from home in order to attend the Central Technical College, a monetary allowance of *thirty pounds (£30) per annum* will be granted. In cases where the student need not board away from home in attending the classes, a travelling allowance not exceeding *five pounds (£5) per annum* may be granted where necessary.

(G) COOKERY CLASSES AT SYDNEY TECHNICAL COLLEGE.

Three Scholarships shall be awarded annually for competition amongst girls over 18 years of age who have gone through a course of instruction in cookery in any of the Technical Schools or Colleges or Public Schools under this Department.

(i) The Scholarships will be tenable for two years at the Sydney Technical College, and will entitle the holders to exemption from payment of fees during the complete Cookery Course, and to a grant not exceeding *one pound (£1)* for necessary text-books. When a student holding a Scholarship must necessarily board away from home in order to attend the College, an allowance of *thirty pounds (£30) per annum* will be granted.

(ii) The holders of these Scholarships will be required to undergo the necessary training as Assistant Teachers of Cookery. *Should, however, a student show, before completion of the first year's course, that she does not possess the necessary qualifications for teaching, the Scholarship will be withdrawn at the end of the first year.*

(H) TO DRESSMAKING AND MILLINERY CLASSES AT THE SYDNEY TECHNICAL COLLEGE.

Three Scholarships shall be awarded annually for competition amongst girls over 18 years of age who desire to become Teachers of Dressmaking and Millinery.

(i) The Scholarships will be tenable for two years at the Sydney Technical College, and will entitle the holders to exemption from payment of fees whilst attending the classes prescribed in the College Calendar, and to a grant not exceeding *one pound (£1)* for necessary text-books. When a student holding a Scholarship must necessarily board away from home in order to attend the College, an allowance of *thirty pounds (£30) per annum* will be granted.

(ii) The holders will be required to pass the annual examinations in the subjects in which they receive instruction. *Should, however, a student show, before the completion of the first year's course, that she does not possess the necessary qualifications for teaching, the Scholarship will be withdrawn at the end of the first year.*

(I) SCHOLARSHIPS IN CONNECTION WITH THE EVENING COURSES AT THE VARIOUS CENTRAL TECHNICAL SCHOOLS AND COLLEGES.

Scholarships shall be awarded annually for competition amongst students going through the regular evening courses in the various Central Schools and Colleges under the Department.

(i) The Scholarships will be awarded on the results of examination held at the end of each year, and they will entitle the successful candidates to exemption from payment of college fees for the courses they are attending for the ensuing year.

(ii) *Two of these Scholarships will be allotted amongst the students of each year in each subject.*

(J) RESEARCH SCHOLARSHIPS.

Research Scholarships, tenable for one or more years, shall be awarded to students who have completed their full course at the Sydney Technical College, on the recommendation of the lecturer or teacher, as approved by the Superintendent. These Scholarships will entitle the holders to the use of laboratories and apparatus necessary for the research undertaken by the student. The work to be undertaken, however, is to be approved by the lecturer in charge of the department, and the research in connection therewith is to be under his supervision and direction.

(K) BURSARIES.

Bursaries, distinguished in these regulations as District and High School, Junior Technical, and Intermediate Technical, shall be awarded annually upon competitive examination to deserving pupils of State schools whose parents' incomes are not sufficient to enable their children to gain a higher education,

TECHNICAL EDUCATION.

DISTRICT AND HIGH SCHOOL BURSARIES (INCLUDING AGRICULTURAL).

District and High School Bursaries to the number of seventy-two (72) annually shall be available for pupils of the following groups of schools, the number allotted to each group to be determined at each half-yearly examination :—

Group (a)—Schools in Classes I and II.

Group (b)—Schools in Classes III and IV.

Group (c)—Schools in Classes V, VI, and VII, including Subsidised Schools.

(i) These bursaries shall be tenable for three years, and will entitle a pupil to free education in a High School, a District School, a Superior Public School, or (in the case of boys) the Sydney Grammar School or in the Hurlstone Agricultural Continuation School or other similar school hereafter established, and to a grant of text-books not exceeding in value *one pound ten shillings* (£1 10s.) *per annum*. When a pupil holding a bursary must necessarily board away from home in order to attend one of these schools, an allowance not exceeding £30 a year, in addition to free education and text-books, will be made, but when it is not necessary on account of distance to board away from home the allowance will not exceed £10 a year.

(ii) A successful candidate who elects to attend the Hurlstone or other Agricultural Continuation School, and who is unable on account of the distance of his home from such school to attend as a Day Student, will be granted free board and residence at the school in lieu of the monetary allowance already specified.

(iii) The examination for District and High School Bursaries will be open to all boys and girls under 15 years of age on the date of examination, provided they have attended a State School with reasonable regularity for one year preceding the date of examination.

(L) JUNIOR TECHNICAL BURSARIES.

Junior Technical Bursaries to the number of twenty (20) annually shall be available for pupils of the following groups of schools, the number allotted to each group to be determined in connection with each half-yearly examination :—

Group (a)—Schools in Classes I, II, III, and IV.

Group (b)—Schools in Classes V, VI, and VII, including Subsidised Schools.

(i) Junior Technical Bursaries shall be tenable for two years at a Technical College or School or Trade School for courses of instruction approved by the Minister, and shall entitle the holders to exemption from payment of fees and to a grant of text-books not exceeding in value *one pound ten shillings* (£1 10s.) *per annum* and, where such is necessary, to a travelling allowance not exceeding *five pounds* (£5) a year to enable the holders to travel from and to their homes to and from the nearest Technical College or School where the desired course of instruction is available.

(ii) In addition to the above, holders of Junior Technical Bursaries who must necessarily board away from home in order to attend the prescribed courses, shall receive an allowance of *twenty pounds* (£20) *per annum*, but when it is not necessary on account of distance to board away from home the allowance will not exceed *ten pounds* (£10) *per annum*.

(iii) The examination for these Bursaries will be open to boys and girls under 15 years of age on the date of examination.

(M) INTERMEDIATE TECHNICAL BURSARIES: TO ORGANISED DAY COURSES AT SYDNEY TECHNICAL COLLEGE.

Eight Intermediate Technical Bursaries shall be awarded annually upon competitive examination to boys who have attended a High School, or the higher primary classes of a District School or of a Superior Public School for two years, and who are under 17 years of age on the 1st day of July following the first, or the 1st day of January following the second, examination in each year.

(i) The Bursary will be tenable for three years at any of the Organised Day Courses of the Sydney Technical College, and will entitle the holder to exemption from payment of fees, to a grant of text-books not exceeding in value *one pound ten shillings* (£1 10s.) *per annum*, and to an allowance of *ten pounds* (£10) *per annum* when the student resides at home, and to an allowance of *thirty pounds* (£30) *per annum* when the student must necessarily board away from home to attend the classes.

PROPOSED REGULATIONS,

STATE SCHOOL SCHOLARSHIPS AND BURSARIES.

Examinations for admission to High Schools, as well as for Scholarships and Bursaries, shall be held half-yearly, in June and December. One half the number of Scholarships and Bursaries annually available shall be awarded after each examination, except in the case of the Scholarships to the Hawkesbury Agricultural College, which will all be awarded in connection with the December examination.

(i) The parents or guardians of candidates for Scholarships or Bursaries must fill in and forward to the Under Secretary the necessary forms of application *at least three weeks before the date of examination*. Such forms may be obtained at the Department of Public Instruction.

(ii) Scholars and Bursars are expected to attend the School (of the class at which the Scholarship or Bursary is tenable) nearest by a practicable route to their places of residence. In exceptional circumstances, however, the Minister may, on application being made, sanction a departure from this rule. The application should accompany the form notifying intention to compete.

(iii) A Scholarship or Bursary may be withdrawn at any time during its currency if the holder fails to attend classes regularly and punctually, or fails to give evidence of satisfactory progress, or if the conduct of the holder is not satisfactory.

(iv) A Bursary shall not be awarded to any candidate whose parents' total income exceeds £300 per annum. The parents of the candidates who are successful in the competitive examination for Bursaries shall, therefore, in each case, be required to make a statutory declaration as to the amount of their income before a Bursary is awarded.

SUBJECTS OF EXAMINATION.

The scope of the examination for Scholarships and Bursaries in each subject will be notified from time to time in the Syllabus of Examinations.

Candidates from schools in classes V, VI, VII, and from subsidised schools, will not be examined in Latin or French.

Subjects of Examination in Section—

(E) English, Arithmetic, Algebra, Geometry, and either Chemistry or Physics—University Junior Standard.

(G) English (Composition), Arithmetic, Domestic Science; Practical Cookery—Text-book recommended, "The Science of Home Life," by W. Jerome Harrison.

(H) English (Composition), Arithmetic, Geometrical Drawing, Practical Test in Needlework.

Since this scheme has been brought into operation, there are thirteen scholars and seventeen bursars attending the Technical Continuation School and Classes.

EXAMINATIONS.

Notes applicable to all Colleges and Schools throughout the State of New South Wales.

NOTE 1.—Special attention is invited to the following extract from the Syllabus of Studies for Public School Teachers and Pupil-teachers, last published by the Public Service Board:—

NOTE 2.—Certificates issued to Teachers and Pupil-teachers by the Technical Education Branch in the undermentioned subjects will exempt the holders from further examination in such subjects, according to the following provisions:—

Physics—Course B and Course C.

Chemistry—First year theory, and first year practice; or first and second years' theory.

Geology—First year.

Botany—First year.

Physiology—The full course.

NOTE.—Students are advised to consult the list of dates for the Annual Examinations, 1909, before joining the classes. The Provisional List is published at the beginning of the year to prevent students taking those subjects the examination for which fall upon the same date.

1. The Annual Examinations are held during the month of December.

2. A student who holds a certificate in any grade will not be awarded a second certificate in that grade.

3. The class work done during the year, either theoretical or practical, or both, will be taken into account in deciding whether a Student is to pass or fail at the annual examination.

4. Students are eligible for examination in any subject in which they have actually received not fewer than 80 per cent. of the total number of lessons forming the complete year's course in the subject. Where the attendance falls short of 80 per cent., the case will be considered on its merits.

5. Prizes are awarded to students who obtain honors, provided they have attended the classes three full terms, *also the term examinations*, in the year in which they are examined, and have not previously passed in the subject.

CERTIFICATES.

Certificates are awarded to students who attend the classes and pass the required examinations.

DIPLOMAS.

Diplomas are awarded to students who have obtained the Certificates in any Department and have passed the final examination in the principal subjects in the first grade.

ASSOCIATESHIPS.

The title of Associate of the Sydney Technical College is conferred upon any student who passes the final examinations in the principal subject with honors. Associates may attend any one course of lectures free of charge.

The title of Associate of the Sydney Technical College is also conferred upon any Teacher or Officer of the Technical Education Branch who has given twenty consecutive years' service in such capacity.

FELLOWSHIPS.

The Fellowship of the Sydney Technical College will be conferred upon those who, having obtained the Associateship, shall have spent not less than six years in actual practice, and shall have done some original and valuable research work, or have contributed to the advancement of the industry in which they are engaged.

The title of Fellow of the Sydney Technical College is conferred upon any Lecturer in charge of any Department, or Resident Master, or a Superior Officer, who has held such position under the Technical Education Branch for at least twenty consecutive years.

Technical College, Sydney.

J. W. TURNER,
Officer Directing Technical Education.

The 1909 Exhibition of Students' Work.

(BY THE EDITOR.)

ON the 26th March, 1909, Mr. Turner, Superintendent of Technical Education in New South Wales, forwarded the following circular letter to every Lecturer and Teacher in the Technical Colleges and Schools throughout the State:—

EASTER EXHIBITION.

" Dear Sir or Madam,

" I am glad to be able to inform you that arrangements are well forward for the forthcoming Easter Exhibition of Technical Education, and as you are no doubt keenly interested in the function, I take this opportunity to apprise you of the draft programme.

" The opening is to take place on Wednesday, April 14th, at 2 p.m.; the official opening at 3 p.m.; the evening session at 7 p.m.

" The Exhibition will then be continued on Thursday, 15th, and Friday, 16th, morning, afternoon, and evening, at 10 a.m., 2 p.m. and 7 p.m., respectively.

" The arrangement of the different exhibits is under the charge of the respective Lecturers who will be responsible for the receipt, arrangement, and despatch of the suburban and country exhibits. These should be sent so as to reach the College on the 5th, or at latest, 7th of April. The usual certificates for reduced railway fare will be issued from the Central College to country students who wish to attend the Exhibition.

" Your resident master has, no doubt, impressed upon you the need for every possible effort being made to insure success.

" The Exhibition, which will be the function of the technical year, must be thoroughly representative. We must exhibit of our best when we go before the general public for their recognition.

" Again, the value of the Exhibition to Teachers and Students cannot be over-estimated. By it the past results can be compared with the present instruction, defects remedied and an incentive given for fresh endeavour.

" For these reasons I would urge that sacrifice be made by all to obtain the greatest possible results. Only by the best effort, both in exhibiting and attending, can justice be done the present high-water mark reached by Technical Education in New South Wales."

In a subsequent circular letter equally widely distributed Mr. Turner furnished the following additional particulars:—

" The opening ceremony will take place in the Physics Hall, on Wednesday afternoon, 14th April, at 3 p.m.

" The Hon. J. A. Hogue, Minister of Public Instruction, will preside.

" The Minister has sanctioned the closing of all Colleges and Schools represented at the Exhibition, to enable Lecturers and Teachers to attend.

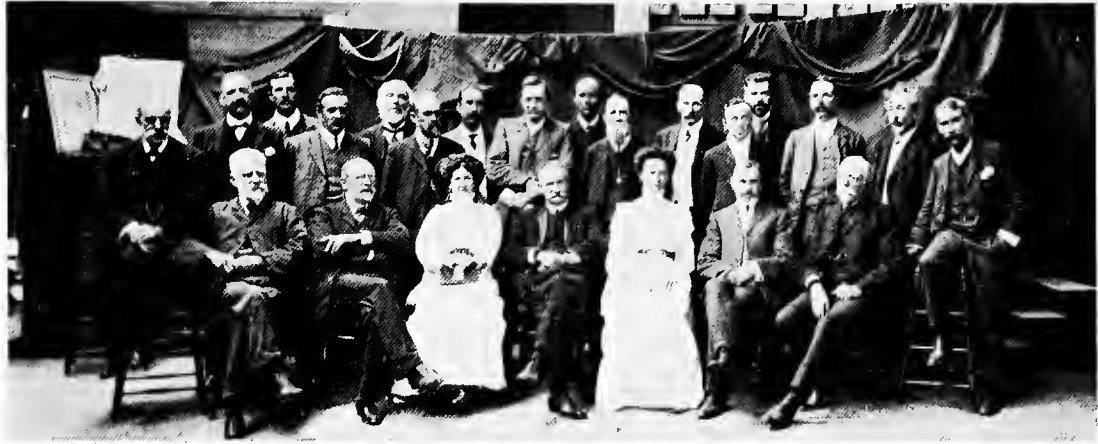
" A Conference of Lecturers and Teachers will be held in the Physics Hall, on Thursday morning, 15th April, at 10.30. You are invited to forward any suggestion on matters which you deem fit for discussion.

" A social reunion of the Staff (including City and Country Members) to which you are cordially invited, will be held in the Technological Museum and Physics Hall, on Saturday evening, 17th April, at 7.30 p.m."

These letters are printed here, first, because they give an excellent epitome of the arrangements made for an exhibition, which not only comprises the work of the students in the great central Sydney College, where the exhibition is held, but also that of those in the Technical Colleges and Schools throughout the whole of a State having an area of 310,372 square miles, more than three and a half times that of Great Britain, and stretching inland from east to west for about 600 miles, and north and south along the coast for about 800 miles.

Second, because they provide a concise statement of the objects the Superintendent had in view in approving and organising the Exhibition; and third, because they furnish an excellent indication of Mr. Turner's methods in dealing with the great body of men and women under his control, who constitute the Technical Teaching and Administrative Staffs,—methods which have earned for him not only the respect, but the sincere affection of every officer in the service.

The idea of instituting an exhibition of this kind, to mark the close of the first quarter century of organised Technical Education in New South Wales, originated with Mr. Turner's Advisory Council, of which he is the President.



MR. TURNER, SUPERINTENDENT OF TECHNICAL EDUCATION, AND HIS ADVISORY COUNCIL, WHICH IS ALSO THE GENERAL EXHIBITION COMMITTEE.

This council which is a permanent body, consisting of the chief officers and lecturers of the Technical Education Branch of the Department of Public Instruction, was called into existence for the first time by Mr. Turner, immediately on his accession to the position of Superintendent of Technical Education, and it is intended that it should also form the permanent general committee of this, and of the subsequent regular annual exhibitions which are contemplated.

This act of Mr. Turner's, which was as welcome as it was unprecedented, initiated a policy which he has steadily pursued ever since.

To any one who has read this monograph, and has observed the absolute diversity of the Technical subjects dealt with by the men and women teachers, all of whom are specialists in their own particular lines, it must be abundantly evident, that no one man, however clever, could possibly be practically acquainted with the Technical detail of each branch. It naturally follows that any attempt to force those experts to adopt methods, of which they disapproved, and which they knew could not be founded on any practical knowledge of their work, could only end in dissatisfaction if not disaster, and must inevitably lead to disorganisation, and the weakening of that respect and personal influence which every successful captain of Technical Education must, as a matter of course, command.

Mr. Turner, with that breadth of mind, that perfect and firm grasp of the duties of his high position, and that unsurpassed firmness, tact, and kindliness, in dealing with men and women, all of which are characteristic of him, has frankly admitted his belief in those facts from the first, and has acted on that belief. This he has made plain not only to his Teaching Staff, but also to the many representatives of the vast variety of Professions, Trades, and Callings, who have interviewed him in regard to the Technical subjects in which they were interested, and while always making it perfectly clear that he reserved to himself his undoubted right to adopt, or reject, he always has made it equally clear that he welcomed their interest in the work, and their freely expressed opinions as to its conduct and improvement. The

result of this policy has been simply what might be expected ; he is respected, admired, and approved of by all with whom he has come in contact—by his Teachers, and by the interested public alike. The former are eager to carry out his orders, and in the latter has been created a personal interest in the progress and success of the whole work, which is already bearing good fruit.

The success of this Exhibition is but another evidence of the success of Mr. Turner's administration. The members of his Staff throughout the whole State have gone heartily into the matter, not only as a duty, but as a pleasure, and in this way an assemblage of work has been secured, which would have been impossible with a mere half-hearted obedience to the commands of a less loved head.

Besides showing those of the general public who visit this Exhibition the nature and quality of the work being done ; there is another very important object which is referred to in the circular letter printed in this article. The examinations set, are the same all over the State, and all the examination papers are sent down to Sydney, and examined together by experts in each branch of the work. But, with our immense distances in New South Wales, it is obviously impossible to deal in the same way with the whole mass of the practical work done during the year, and equally impossible for the Sydney experts to visit the widely separated Colleges and Schools to inspect it. It has, therefore, been found necessary to call on the teachers themselves, at each separate centre, to appraise this class of work. As all the certificates issued to the students throughout the State are intended to have the same value, it thus becomes of the utmost importance that each teacher should judge his students' practical work from the same high standard. This exhibition, affording as it does, an opportunity to each of those teachers to compare the best of his own students' work with the best of the work produced at the Central College, or elsewhere, will be of incalculable value in establishing such a standard, but also, as the Superintendent clearly puts it in his circular letter quoted, " by it the past results can be compared with the present instruction, defects remedied, and an incentive given for fresh endeavour."

The following are the names of the members of the Sub-committees who have special charge of the subjects named, in connection with this Exhibition :—

GENERAL EXECUTIVE COMMITTEE.

Messrs. J. W. Turner (Convener), G. Hooper, C. A. Sussmilch, A. W. Chapple and W. J. C. Ross.

GENERAL DECORATION COMMITTEE.

Messrs. J. R. Wright (Convener) P. W. Johnston, and H. Lord.

RECEPTION COMMITTEE.

Messrs. J. W. Turner (Convener), G. Hooper, W. J. C. Ross, and Misses Monro and Roberts.

PRINTING AND PRESS-WORK (PUBLICATION COMMITTEE).

Messrs. J. L. Bruce (Convener and Editor), C. A. Sussmilch, J. R. Wright, J. B. Brown and J. Nangle.

As this brief notice is necessarily written before the actual opening of the Exhibition, it is impossible to enter into detail. There is, however, already sufficient evidence to prove the reality of its representative character, and consequent success as regards its main object, namely, in proving to the public the variety and excellence of the work done.

That the Public of New South Wales will take advantage of the opportunity offered there can be no doubt ; their warm interest in the subject is shown by the enormous numbers of their representatives, who nightly attend the various classes throughout the State. Even if only the parents and friends of the thousands of Technical students visited the Exhibition, its success in that respect also would be assured.

THE TECHNICAL EDUCATION BOARD FROM 1883 TO 1889.

The old New South Wales Board of Technical Education, which initiated the first organized system of Technical Education in Australia, consisted of the following gentlemen:—

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